A STUDY ON ANALYSIS OF FUNCTIONAL OUTCOME OF PERCUTANEOUS RELEASE IN TRIGGER FINGER UNDER ULTRASOUND GUIDANCE – A NOVEL TECHNIQUE

(PROSPECTIVE STUDY)

Dissertation submitted in partial fulfillment of the regulation for the award of

M.S Degree in Orthopaedic Surgery

Branch II

THE TAMILNADU

Dr. M. G. R. MEDICAL UNIVERSITY

CHENNAI – 600 032.

APRIL – 2019

MADURAI MEDICAL COLLEGE

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CERTIFICATE

This is to certify that the work **"A STUDY ON ANALYSIS OF FUNCTIONAL OUTCOME OF PERCUTANEOUS RELEASE IN TRIGGER FINGER UNDER ULTRASOUND GUIDANCE – A NOVEL TECHNIQUE (PROSPECTIVE STUDY)"** which is being submitted for M.S. Orthopaedics, is a bonafide work of **Dr.A.MURUGESAN**, Post Graduate Student at Department of Orthopaedic surgery & Traumatology, Madurai Medical College, Madurai.

The Dean,

Madurai Medical college,

Madurai.

CERTIFICATE

This is to certify that this dissertation titled **"A STUDY ON ANALYSIS OFFUNCTIONAL OUTCOME OF PERCUTANEOUS RELEASE IN TRIGGER FINGER UNDER ULTRASOUND GUIDANCE – A NOVEL TECHNIQUE (PROSPECTIVE STUDY)"** is a bonafide work done by **Dr.A.MURUGESAN,** postgraduate student of Madurai Medical College & Govt Rajaji Hospital.

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CERTIFICATE

This is to certify that this dissertation **"A STUDY ON ANALYSIS OF FUNCTIONAL OUTCOME OF PERCUTANEOUS RELEASE IN TRIGGER FINGER UNDER ULTRASOUND GUIDANCE – A NOVEL TECHNIQUE (PROSPECTIVE STUDY)"** is the bonafide work done by **Dr.A.MURUGESAN** under my direct guidance and supervision in the Department of Orthopaedic Surgery, Madurai Medical College, Madurai-20.

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ACKNOWLEDGEMENT

I am grateful to **Prof. Dr.R.ARIVASAN, M.S.Ortho.,** Professor and Head, Department of Orthopaedic Surgery and Traumatology, Madurai Medical College in guiding me to prepare this dissertation.

I am greatly indebted and thankful to my beloved chief, and my guide **Prof.Dr.V.R.GANESAN, M.S.Ortho, DNB.Ortho., D.Ortho.**, Ortho-II unit, Department of Orthopaedic Surgery and Traumatology, Madurai Medical College for his invaluable help, encouragement and guidance rendered to me in preparing this dissertation.

I am most indebted and take immense pleasure in expressing my deep sense of gratitude to **Prof.Dr.N.Thanappan M.S.Ortho, Prof.Dr.B.Sivakumar M.S. Ortho., D.ortho,** for their easy accessibility and timely suggestion, which enabled me to bring out this dissertation.

At the very outset I would like to thank **Prof.Dr.D. MARUTHU PANDIYAN, M.S, FICS, FAIS.,** the Dean, Madurai Medical College and Govt. Rajaji Hospital, Madurai for permitting me to carry out this study in this hospital.

I take immense pleasure to thank my co-guide **Prof. Dr.N.Thanappan M.S.Ortho.,** for his timely help and encouragement.

I also take this opportunity to thank **Dr.J.Maheswaran M.S.Ortho, Dr.M.N.Karthi, M.S.Ortho, Dr.T.C.Premkumar, M.S.Ortho, Dr.T.Saravana Muthu, M.S.Ortho., Dr.R.Karthik Raja, M.S Ortho., Dr.V.A.Prabhu, M.S.Ortho., Dr.K.Senthil Kumar, M.S.Ortho., Dr.Gopi Manohar, D.Ortho, DNB Ortho., Dr.Gokulnath, M.S.Ortho., Dr.Anbarasan, M.S.Ortho., Dr.S.Karthikeyan, M.S.Ortho., Dr.K.Singaravelu, M.S.Ortho** Assistant Professors, Department of Orthopaedics, Madurai Medical College, for their timely help and guidance given to me during all stages of the study.

Last but not the least, I express my gratitude to the patients for their kind co-operation.

DECLARATION

I, **Dr.A.MURUGESAN**, solemnly declare that the dissertation titled **"A STUDY ON ANALYSIS OF FUNCTIONAL OUTCOME OF PERCUTANEOUS RELEASE IN TRIGGER FINGER UNDER ULTRASOUND GUIDANCE – A NOVEL TECHNIQUE (PROSPECTIVE STUDY)"** has been prepared by me. This is submitted to **"The Tamil Nadu Dr. M.G.R. Medical University, Chennai,** in partial fulfillment of the regulations for the award of M S degree branch II Orthopaedics.

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INTRODUCTION

Trigger finger is a condition that causes painful catching or popping of the involved flexor tendon as the patient flexes and extends the fingers. This condition is also known as " stenosing tenosynovitis" .Trigger finger is one of the most common pathologic conditions in hand surgery, with incidence rates of 2.2% throughout life time in the non diabetic population more than 30 years and 10% in the diabetes mellitus populations.

It is more common in women than in men, and the incidence increases with increasing age, to a peak in the fifth or sixth decade of life. More commonly involved in thumb, followed by the ring, long, little, and index fingers in multi digit involvement. Secondary trigger finger can be seen in patients with diabetes, gout, renal disease, RA, and other rheumatic diseases and is associated with a worse prognosis after conservative or surgical management.

There are various conservative and surgical methods for the treatment of trigger finger. Usually, trigger finger is initially treated with conservative managements, like wearing a splint and taking nonsteroidal anti-inflammatory drugs or undergoing cortisone injections in acute stage. If conservative managements fail, the A1 pulley can be surgically released; good results have been reported in 60%–97% of cases.

Despite its popularity and efficacy, the classic open volar release technique for the A1 pulley release has been reported with dissatisfaction rates as high as 15% to 26%.).Percutaneous surgical technique, as a convenient, cost-effective method with a low complication rate, is becoming more popular than open surgery. It was First described by Lorthioir in 1958.

Blind percutaneous release of A1 pulley by using simple clinical landmarks was first described in 1958. The results and effectiveness was equal to that of an open release procedure; however, complications like wide release of A1 pulley that extends to the A2 pulley or injury to interdigital nerves have been reported. Even though,the complication rate is low (0.02%).

Jou and Chern introduced ultrasound imaging as an adjunct for guiding the needle in percutaneous release of trigger finger with the use of modern ultrasonographic equipment, this type of treatment procedure can also be done using US guided technique and performed with a 2.5–2.6-mm hook or a 19-gauge, 1.27-mm needle . This technique has the advantage of providing direct visualization of the neurovascular structures during the procedure.In ultrasonography A1 pulley seen as (1): hypoechogenic or even Doppler hyperemic thickening of the A1 pulley with abnormal underlying flexor tendons.).

The purpose of our study is to analyse the functional outcome of percutaneous release in trigger finger under ultrasound-guidance.

HISTORY

In 1874, Menzel demonstrated a precise theory concerning the origin of a triggered digit.

In 1950, Notta reported that four patients who presented with fingers that could not be easily, extended from the flexed position.

In 1954, Fahey and Bollinger have done a microscopic examination of A-1 pulleys of trigger finger patients discovered that Notta's nodule was actually "the thickened fibrous sheath".

In 1958, Lorthioir J -Describe the Surgical Treatment of Trigger-Finger by a Subcutaneous method.

In 1972, Dr. J.T. Hueston and W.F. Wilson proposed that the formation of Notta's nodule as the result of a stenosed tendon sheath.

REVIEW OF LITERATURES

Dr. A. Notta in 1850 an “interné” in Paris, described 4 adult patients who had a nodule on a flexor tendon of a digit, thereby inhibiting its normal movement . After the publication of his article, these “nodules” being called “Notta's nodules”.

Lorthioir J in 1958-Described the Surgical Treatment of Trigger-Finger by a Subcutaneous Method.

Hueston et al., in 1972- studied about the spiral arrangement of the intratendinous fibrous architecture lends itself to the development of a structure defect or nodule development distal to a stenosed proximal sheath pulley. After the release of the proximal pulley constriction ,the nodule can disappear by a process of unspiralling under the normal longitudinal forces acting on the tendon.

Quinnell et al. in 1980-They sorted out the trigger fingers based on severity of symptoms.

Freiberg et al.in 1989-They conducted the study of non operative treatment of trigger finger and thumb with steroid injections into the flexor tendon sheath.They conclude that the patients with the nodular type can be offered a simple steroid(cortisone) injection. Those patients seen initially with the diffuse type of lesions should be offered surgical decompression.

Lin et al.in 1989-They described the functional anatomy of the human digital flexor pulley system. Bowstringing occurs at the proximal interphalangeal joint only after 30 degrees of flexion had occurred, because of the convexity of the phalangeal condyles.

Yosipovitch et al.in 1990-They conducted the study to find out the prevalence of trigger finger in insulin dependent diabetes.250 patients with juvenile diabetes mellitus aged 3-38 years, were examined for trigger finger. They found that there was a significant correlation between duration of diabetes and trigger digits but no correlation with the control of diabetes.

Anderson et al.in 1991-They developed a protocol to maximize medical therapy for "trigger finger." They have conducted a study of response to local steroid injection in trigger digits. They found that the medical management of Trigger finger with local corticosteroid injections is effective in nearly 90% of cases and is free from serious complications.

Eastwood *et al*., In 1992 -Performed the percutaneous surgical release technique as a convenient, cost-effective method with a low complication rate. He suggested percutaneous surgical release will reduce the complications such as infections, painful scar formation, digital artery or nerve damage, bowstringing of the flexor tendons due to pulley injuries, joint stiffness and weakness that can be seen with open surgery.

Griggs et al.IN 1995-Have done retrospective study is the treatment of trigger finger in patients with diabetes mellitus. They have treated the 54 diabetic patients with 121 trigger digits treated over a three year period by 1 to 3 corticosteroid injections mixed with local anesthetic. They concluded that the diabetic patients responded less favorably to treatment by steroid injection when compared to general population.

Pope et al.in 1995-They conducted the study to determine the Safety and efficacy of percutaneous trigger finger release. Twenty-five A1 pulleys in 5 fresh cadaveric hands and 13 trigger fingers in 11 patients were released by percutaneous technique using a 19 gauge needle. They observed that, complete clinical release was achieved in each digit. There were no complications like injuries to the A2 pulley, nerves, or vessels.

Patel et al.in 1997-Done a study of percutaneous release of trigger digit with and without cortisone. It shows higher successful rate with cortisone injection with percutaneous release. This can be done under local infiltration anesthesia in the office. It reduced patient anxiety, inconvenience and hospital cost.

Cihantimur et al.in 1998- Performed percutaneous A1 pulley release on 34 trigger digits with an angiocath needle. They found that the Complete release was achieved in all fingers. After the mean 0.5(1-2) years of follow-up, there was no complications and no recurrences.

Rodgers et al., in 1998 -Conducted a study to evaluate the efficacy of functional distal interphalangeal joint splinting for the treatment of trigger finger. They conclude that DIP splinting provides a reliable and functional means of treating work-related trigger finger without lost time from work.

Gorsche et al.in 1998-conducted a study on incidence of trigger digits among the workers who were using hand tools and non -tool use workers. Concluded that there is an increased risk of Trigger finger in hand-tool using workers.

Froimson in 1999 - proposed different classification systems for trigger digits according to mechanical disorders and symptoms.

Katzman et al.in 1999 -They performed a combination of retrospective and prospective study on the utility of taking radiographs in patients with trigger finger. 93 patients with a total of 110 involved fingers were analysed. No abnormality were detected in 62% of the radiographs. No radiographic finding changed the management. Concluded that no need of routine radiographs in patients with trigger finger without a history of injury or inflammatory arthritis.

Blumberg et al in 2001-They have done a Percutaneous release technique in trigger digits to evaluate the outcomes. 31 trigger fingers were treated by percutaneous release of A1 pulley using 18 gauge needle under

local anaesthesia. They observed that there is complete relief of their symptoms after the mean followup of 14 months.

Gilberts et al., in 2002-Done a long-term comparative study between percutaneous release and open release of A1 pulley in trigger finger. results shows an outstanding results for both techniques.

Park et al.in 2004 -Performed one hundred and eighteen percutaneous releases of the locked trigger fingers in an office setting using a specially designed knife. Successful percutaneous release was achieved for 107 digits .There was no neurovascular injury has occurred in their study. They suggested that a locked trigger fingers can be successfully treated with the percutaneous technique.

Akhtar et al.in 2005-Proposed that the Percutaneous release technique of trigger digits is a safe and effective means of treating trigger finger and can be done in the outpatient clinic.

Fitzgerald et al.in 2005 -They reported a case study of delayed rupture of the flexor digitorum superficialis and profundus tendons after the use of local corticosteroid injections for trigger digits.

Ragoowansi et al in 2005 -conducted a study to analyse the outcomes of percutaneous release of A1 pulley using a 'lift-cut' technique,after the 240 trigger digits were treated by percutaneous release using a 'lift-cut' technique.

They concluded that clinically there is no evidence of flexor tendon injury or digital nerve. They recommended this technique as a safe and effective outpatient procedure for trigger finger treatment.

Jou IM et al.,in 2006 – Introduced a sonographically assisted percutaneous technique for releasing trigger finger .It provided a direct visualization of the release and decreased the risks of incomplete release and damage to nearby neurovascular structures associated with other percutaneous release techniques.

Dahabra et al.in 2007-Performed a percutaneous release of trigger digits of 42 patients. After the mean follow up period of 18 weeks they concluded that the Percutaneous A1 pulley release is a safe, and convenient outpatient procedure for the treatment of trigger digits. It is well tolerated by patients and should be the treatment of choice for the established trigger digit.

Baumgarten et al. in 2007 -They observed that the use of corticosteroid injections for the treatment of trigger digit may be less effective in patients with systemic manifestations of diabetes mellitus.

Sbernardori et al.in 2007-They conducted a study of histopathology of A1 pulley in adult trigger fingers. The evaluation of the normal A1 pulley revealed a bi-laminar structure. In trigger finger, there is a possiblity to identify a tri-laminar structure.Appreciable amount of chondroid metaplasia

was there in this layer. They concluded that, there was an additional layer in the A1 pulley in pathological cases which was not present in normal pulleys.

Tamez-Cavazos et al.in 2008-They have conducted the case-control, retrospective, and observational study to find out the risk factors for trigger digits.They concluded that a significant statistical relationship was found, it was more frequent in women >53 years old. It may be related to diabetes, obesity and certain occupations such as secretary, seamstress and homemaker.

Katsarma et al., in 2009 -performed ultrasound-guided percutaneous releases in 35 trigger digits. At followup, they found that no complications had occurred and all patients showed improvement. This new technique is safe and can be used to provide definitive management for trigger finger, allowing the procedure to be performed in a variety of clinical settings.

Gruber et al., in 2011 -Defined the diagnostic efficiency of the newly proposed sonographic dark tendon sign (DTS) alone, or impaired tendon gliding alone and the combination of these two features. The combination of clinically impaired tendon gliding plus the Dark tendon sign reached a sensitivity and diagnostic efficiency of 100%.

Amrani et al., in 2011., Done a study on percutaneous release of the A1 pulley using a needle in 63 Congenital trigger thumb in paediatric patients. Concluded that Percutaneous release of congenital trigger thumb can be

performed safely and effectively in children by a surgeon specializing in hand surgery without any neurovascular deficit clinically.

Zyluk et al in 2011-They conducted a study to compare the results of percutaneous A1 pulley release and steroid injection . They concluded that percutaneous A1 pulley release is more effective medium-term therapy for trigger finger than corticosteroid injection, because of lower risk of recurrence.

Fiorini et al IN 2011 .,They conducted a study to figure out the palmar surface specifications to identify the exact location of the proximal edge of the flexor tendon A1 pulley relative to the digital palmar crease. The distance between the proximal interphalangeal creases and digital palmar may be used as a cutaneous landmark. Thereby ensuring the safety in surgical procedures such as percutaneous release of trigger digits.

Sato et al in 2012- conducted a study to evaluate the effectiveness of Cortico Steroid injection, percutaneous pulley release and conventional open surgery for treating trigger digits in terms of cure, relapse and complication rates. The percutaneous and open surgery techniques shows similar effectiveness and proved superior to the conservative method regarding the trigger cure and relapse rates.

Bekir Yavuz Uçar et al, in 2012**,** performed a comparative study between percutaneous release and open release for trigger finger. After the mean follow up period of 30 months they found that Percutaneous surgical release of trigger finger is an effective, convenient and cost-effective method with a low complication rate, and its a preferable alternative to open surgery.

Dala-Ali et al.in 2012, they performed the study about the efficacy of steroid injection in the treatment of trigger finger. They concluded that, steroid injection is a successful first-line intervention for the treatment of trigger fingers, especially in the thumb. The total efficacy of the steroid injections was 66% in the study.

Guler et al.in 2013-They conducted the retrospective study to compare the outcomes and complications of percutaneous needle release and conventional open surgical release in the treatment of trigger thumb. At final follow-up, they found that no patient had tendon bowstringing, recurrence, joint stiffness, or loss of thumb range of motion. A total of 98.1% of patients in the open release group and 97.1% of patients in the percutaneous pulley release group were satisfied with treatment. They concluded that both open and percutaneous techniques resulted in same therapeutic efficacy, and the rate of potential complications was also statistically similar in each group.

Zhao L, et al. **,** in 2014-performed a meta-analysis of percutaneous procedures .A total of 34 studies involving 2,114 were included in this study.

They found that the Percutaneous release of A1 pulley is a safe and effective procedure for the treatment of trigger finger with success rate around 94%.

Wang et al., in 2015- performed a retrospective study comparing 32 open surgical cases and 40 Percutaneous releases. No statistical clinical differences were detected between this two. The results suggested that Percutaneous release of A1 pulley in trigger finger is a satisfactory good alternative to open release.

Huang et al .,in 2015- They compared the short-term (3 months) and long-term (2 years) outcomes and complications of percutaneous release of 187 trigger fingers. They observed that the only short-term complication was pain and the long-term complications were pain in 25% of the diabetic patients and 14% of the non-diabetic patients. Recurrent triggering occurred in 15% of the diabetic patients, which was higher than the non-diabetic patients.

Hoang et al.in 2016-They conducted the study to evaluate the safety and efficacy of traditional percutaneous and ultrasound (US)-guided first annular (A1) pulley releases performed on a perfused cadaveric model.

Grinčuk et al.-in 2017-Conducted a study to identify the location of the A1 pulley with combination of palpation technique with superficial palm landmarks and to determine the efficacy and safety of A1 pulley percutaneous

release with a 19-gauge needle. Concluded that the Percutaneous release of the A1 pulley with a 19-gauge needle shows acceptable results in both safety and efficacy.

AIM OF THE STUDY

A STUDY ON ANALYSIS OF FUNCTIONAL OUTCOME OF PERCUTANEOUS RELEASE IN TRIGGER FINGER UNDER ULTRASOUND GUIDANCE – A NOVEL TECHNIQUE (PROSPECTIVE STUDY)

OBJECTIVES

- To study the functional outcome of percutaneous release in trigger finger using 18G needle under ultrasound guidance.
- To provide pain- free, effective, safe, convenient procedure for the treatment of trigger finger.

EPIDEMIOLOGY

Trigger finger incidence is 2.2% in the non diabetic population more than 30 years and 10% in the diabetes mellitus populations.

It is more common in healthy middle aged women with a frequency of two to six times than that seen in men. The incidence increases with increasing age, to a peak in the fifth or sixth decade of life.

More commonly involved finger is the thumb, followed by the ring, middle, little, and index fingers in multi digit involvement.

ANATOMY:

FLEXOR TENDON PULLEY SYSTEM OF HAND:

Flexor tendon pulley system consists of annular ligaments of the fingers or A pulleys, and cruciate pulleys (C pulleys).

Flexor pulley system consists of following

- Palmar Aponeurosis Pulley
- 5 Annular Pulleys
- 3 Cruciform pulleys.

They form a fibro-osseous tunnel on the palmar aspect of the hand through which the superficial and deep flexor tendons pass.

- Flexor pulley system of tendon maintains the tendons close to joint's axis of motion and this will prevent bow stringing of fingers.
- Digital flexor sheath is a synovial sheath, it consists of retinacular parts and membranous parts.

Membranous part consists of two layers, visceral and parietal layers. It carries the flexor digitorum superficialis and flexor digitorum profundus tendons in the distal region of the hand.

The flexor pulley system is formed by the retinacular parts which condensate and are arranged in annular pulleys, cruciform and transverse patterns. These flexor pulley systems overlie the membranous lining.

Digital sheath serves following functions

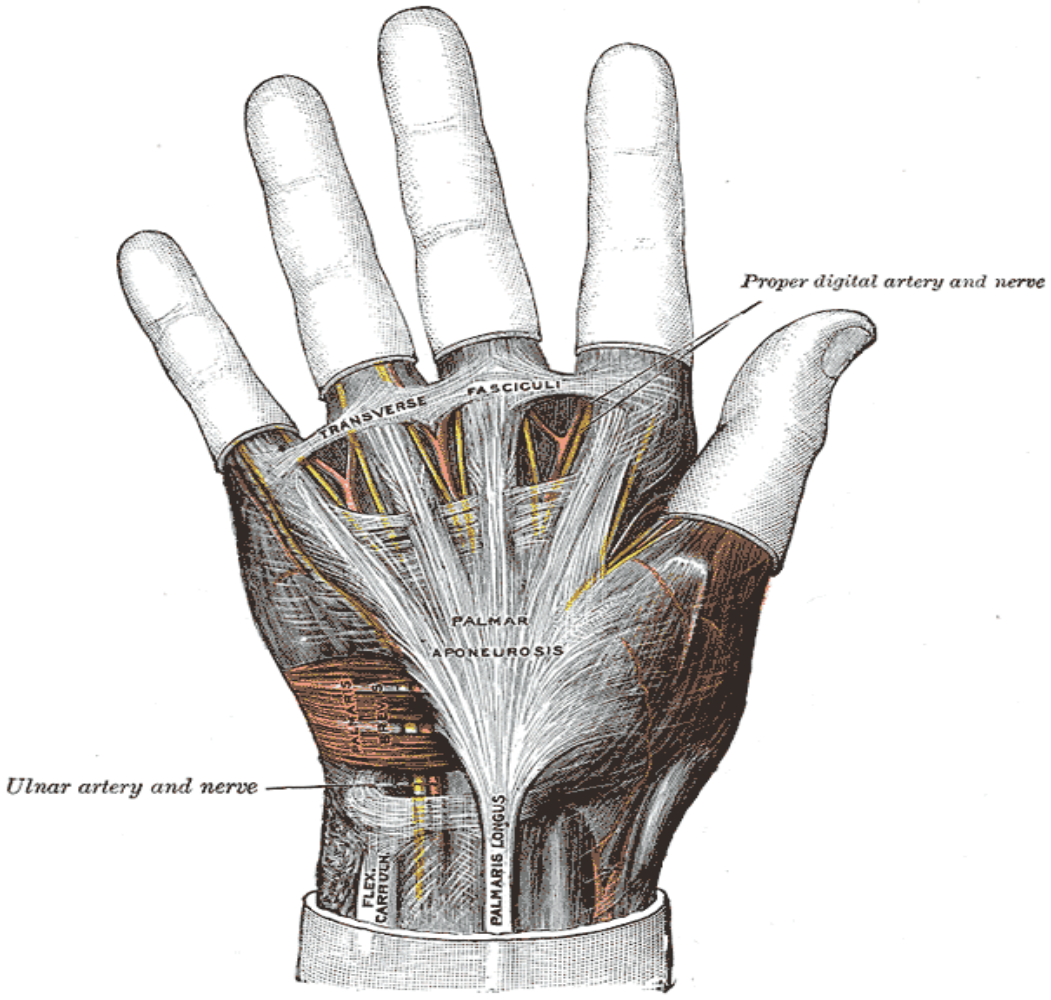
- It facilitates smooth gliding of the tendons.
- Pulleys from retinacular parts provide a mechanical advantage to flexion.
- Nutrition and lubrications provided by Synovial fluid.

Components of Flexor Tendon Pulley System

Palmar Aponeurosis Pulley:

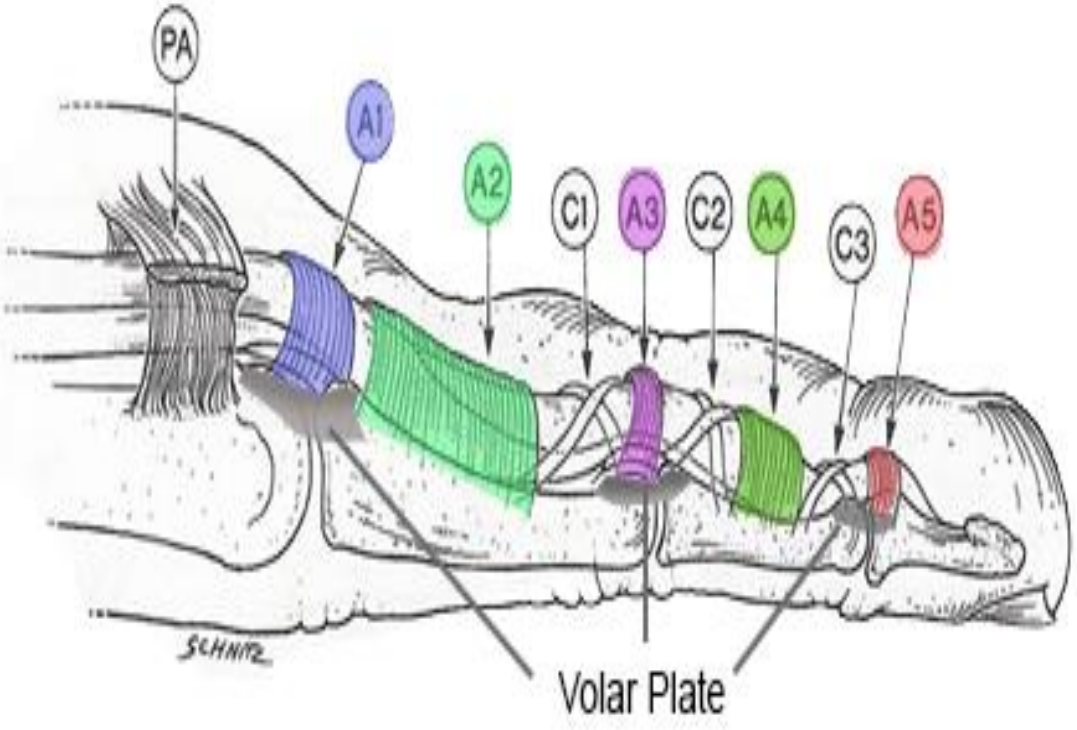
It is formed by transverse fascicular bands relatively 1 cm in width .It arises from the palmar aponeurosis of the hand.

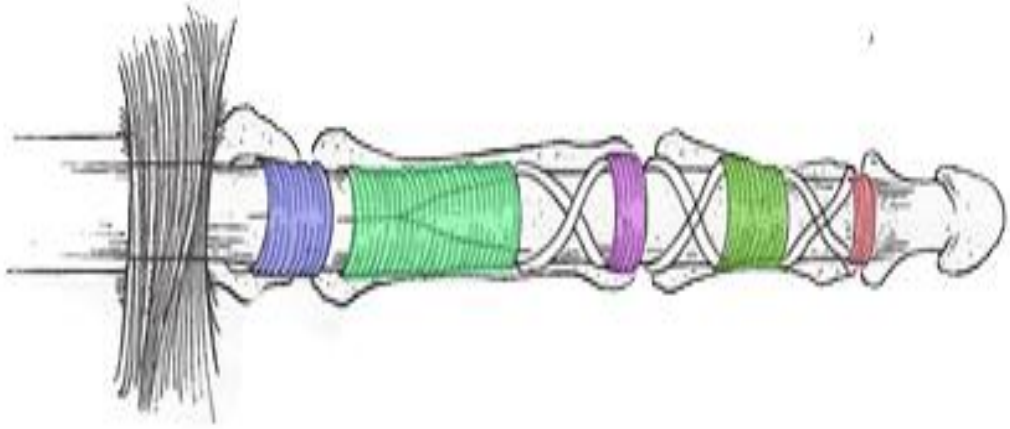
The proximal edge of the palmar aponeurosis pulley is about 1-3 mm proximal to the origin of the membranous tendon sheath and the distal edge is around 8-10 mm from the proximal edge of the 1st annular pulley.



A vertical septa anchors this pulley to the deep transverse metacarpal ligament underneath the tendons. During hand grasping due to increased tension on the palmar fascia by the flexor carpi ulnaris and palmaris longus muscles, this pulley moves closer to tendon surface.

Annular Pulleys:





A1 Pulley:

A1 pulley is first annular pulley, arises from the palmar plate and proximal portion of the proximal phalanx. It's at the level of metacarpophalangeal joints and it is about 8 mm in width .

Proximal edge of the first annular pulley(A1 pulley) lies about 2 cm from the proximal finger crease and distal edge of first annular pulley lies about 1 cm from the proximal finger crease.

The flexor digitorum superficialis tendon bifurcates and allows flexor digitorum profundus tendon to pass superficial at the level of the first annular pulley(A1 pulley).

This pulley is most commonly involved in trigger finger.

A2 Pulley:

The 2nd annular pulley(A2 pulley) arises from periosteum of the proximal and lateral areas of the proximal phalanx, and is about 20 mm in width.

This A2 pulley consists of oblique fibers and is of all of the flexor tendon sheaths, this is probably the most important.

A3 Pulley:

This is the 3rd annular pulley (A3 pulley) and is situated at the level of the proximal interphalangeal joint of digits. It originates from the volar palmar plate and is about 3 mm in width.

A4 Pulley:

The 4th annular pulley (A4 pulley) located in the mid-portion of middle phalanx and arises from periosteum. It is similar to A2 pulley in that oblique fibers overly annular fibers. This pulley is also important to prevent bowstring and to be preserved during surgery.

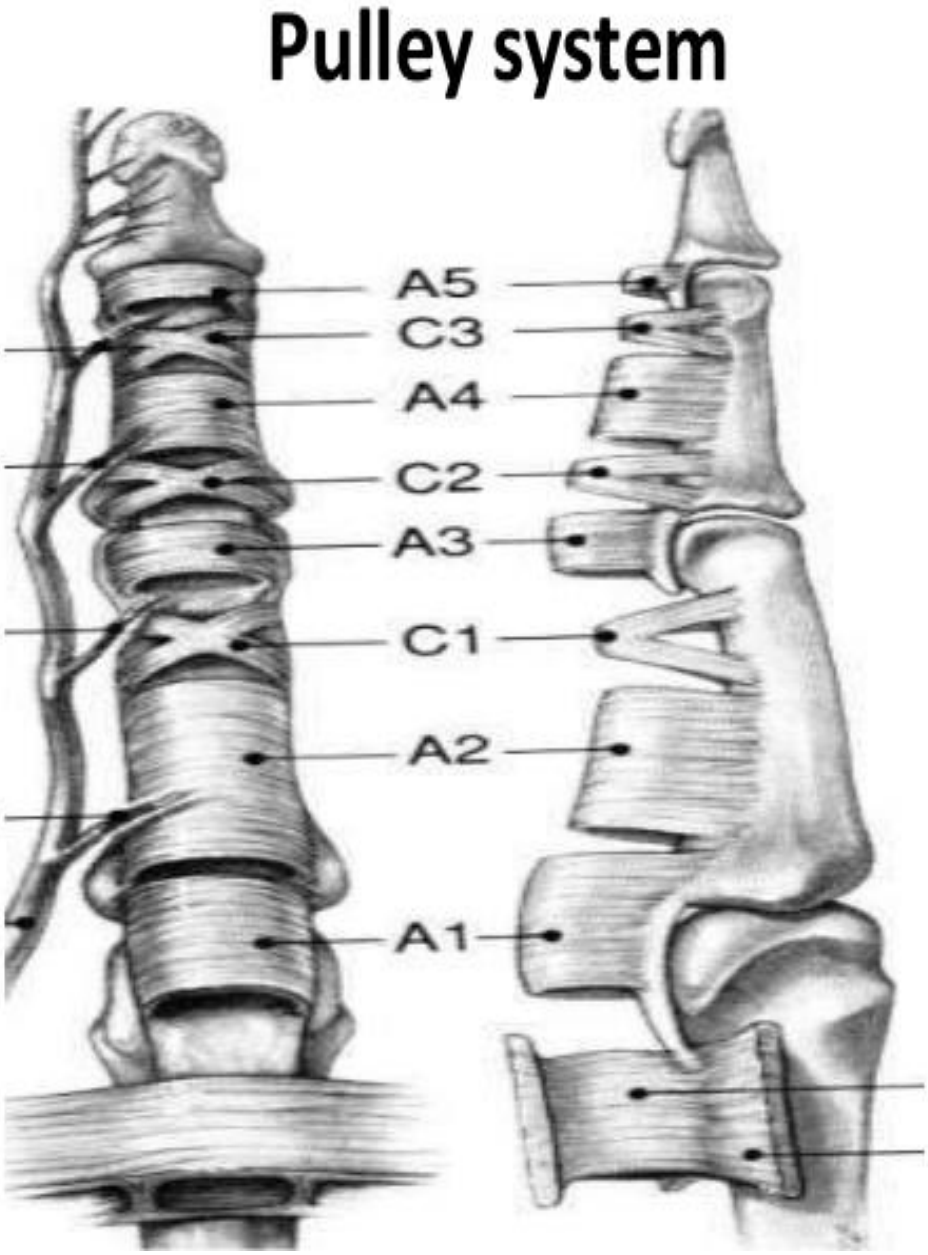
The width of 4th annular pulley is about 7 mm. It is considered 2nd most important flexor tendon pulley (after the A2) and the most important biomechanical pulley for maintaining independent interphalangeal joint function.

A5 Pulley:

This 5th annular pulley is located proximal to distal interphalangeal joint, just proximal to the membranous sheath termination. It width is about 4 mm and the A5 pulley is the thinnest of the five annular pulleys.

CRUCIFORM PULLEYS:

The cruciform pulleys also called as cruciate pulleys. The function of the three cruciate pulleys is to prevent sheath collapse and expansion during digital movements.It facilitates approximation of annular pulleys during flexion.



C1 Pulley :

This first cruciate pulley lies just distal to the 2nd annular pulley(A2 pulley).

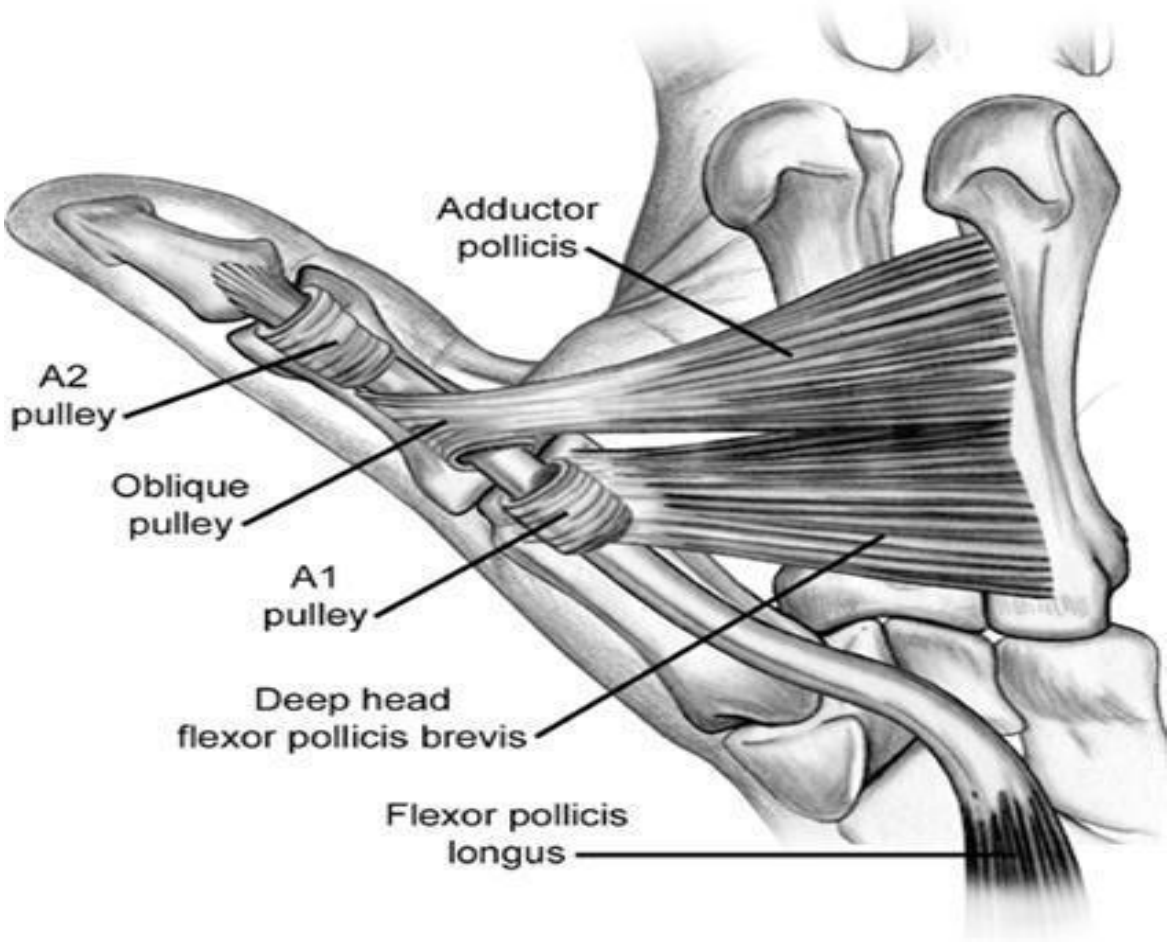
C2 Pulley :

This second cruciate pulley is located in the space between the A3 and A4 pulleys.

C3 Pulley:

This is 3rd cruciate pulley located distal to the A4 pulley, though number of variations have been described.

Flexor Tendon Pulley System of Thumb



There is a separate flexor tendon pulley system for Thumb.

The flexor sheath of thumb arise proximal to the radial styloid in the wrist and transmit the single flexor pollicis longus tendon.

The retinacular parts consists of three separate pulleys overlying the membranous sheath. These are

A1 Pulley:

The 1st annular pulley is located at the metacarpophalangeal joint level. It is around 4-8mm wide, 6mm in length and arise from the volar plate and base of the proximal phalanx. The radial digital nerve is closest (2.7mm) to A1 pulley and ulnar digital nerve is less close (5.4mm) to A1 pulley.

Oblique Pulley:

This oblique pulley originates at proximal half of proximal phalanx.Its about 10 mm in length, and blends with a portion of the adductor pollicis insertion.

It is most important pulley in thumb which facilitates full excursion of flexor pollicis longus and prevents bowstringing of flexor pollicis longus.

A2 Pulley:

The 2nd annular pulley is 5-10mm in width and attaches to the volar plate of the interphalangeal joint. It contributes least to the arc of motion of thumb.

Av pulley (annular variable pulley):

It lies between A1 and oblique pulleys and about 4-8mm in length. It was previously thought to be part of oblique pulley. It also helps to prevent bowstringing.

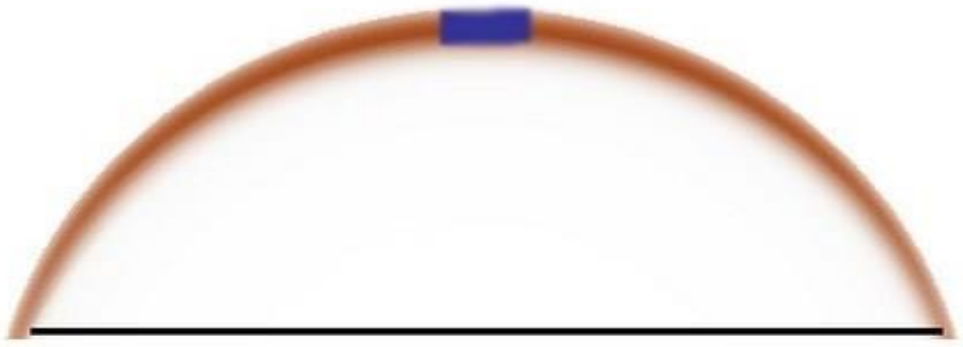
Three types are there,

Type I - transverse, parallel to A1pulley, with gap between Annular variable pulley and A1 pulley.

Type II - no gap between Annular variable pulley and A1 pulley.

Type III - triangular/oblique Annular variable pulley with fibers converging to radial side.

Bowstring Phenomenon:

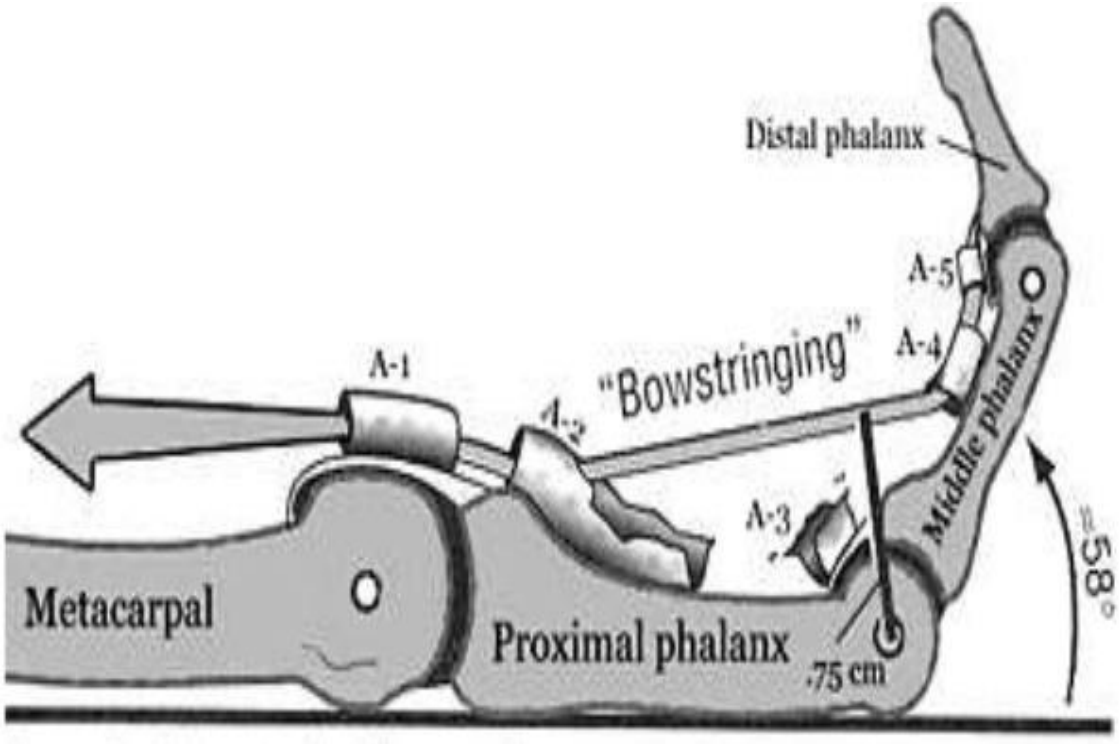


To understand bowstring, we have to imagine bow and string, in which string is straight and bow is in smooth convex fashion.

But when flexing the finger, the different finger joints are at different angles. This is made possible because of the pulleys which keep the flexor tendons close to the bones. This makes the flexor tendon to bend in different points at different curves.

When the pulleys are normal flexing the finger causes the finger bend at different joint level.

But if the flexor pulleys are not present, the tendon will straighten when it tries to contract the digits like string of bow and the finger, instead of bending at different angles at different points, makes on smooth curve just like bow.



This leads to inefficient flexion of the finger, decrease its range of motion.

Pathologic Findings

Twenty two extrinsic tendons cross the wrist joint and provide a unique combination of power and dexterity in the hand. Each tendon passes through a tight fibro osseous tunnel designed to optimize the balance between motion and production of force keeping the tendon in very close apposition to the joints that it controls. Division, rupture or attenuation of a critical pulley or retinacular ligament, will lead to the tendon to drift away from the joint center of rotation and therefore increase its moment arm for force production and lead to imbalance of the tendon and flexion contracture.

Pulley disruption also effectively lengthens the tendon and limits its excursion.

The phenomenon of trigger finger is due to mechanical blockade of the digital flexor tendons as they pass through a narrowed retinacular pulley at the level of the metacarpal head. Proximal phalangeal flexion, particularly with power grip, causes high angular loads at the distal edge of the A1 pulley.

Hueston and Wilson proposed that “bunching” of the interwoven fibers of the tendon occurs, similar to the effect of pulling a multifilament strand through the eye of a needle; this may be responsible for the reactive intratendinous swelling seen at surgery in some cases.The most remarkable pathologic changes are seen in the pulley itself, which demonstrates gross hypertrophy, described by Bunnell as a “whitish, cicatricial collar-like

thickening.”Microscopic examination demonstrates degeneration, cyst formation, fiber splitting, and lymphocytic or plasma cell infiltration.

Ultrastructural studies comparing normal A1pulleys and trigger A1 pulleys have demonstrated the presence of chondrocytes in the normal innermost, or friction layer of normal A1 pulleys and chondrocyte proliferation and the presence of type III collagen in pathologic first annular pulleys. It is thought that the A1 pulley and the parallel surface of the flexor tendon undergo fibrocartilaginous metaplasia under the influence of repetitive compressive loads.

A recent study by Miyamoto and colleagues in which a specialized ultrasonographic compression technique was used documented increases in both stiffness and thickness of the A1 pulley in patients with symptomatic triggering; notably, corticosteroid injection reversed these changes within three weeks of injection.

ETIOLOGY:

Trigger finger may occur as congenital or acquired conditions. In acquired conditions it occurs due to primary causes like repetitive trauma due to sewing, typing, gardening, cutting with scissors, hand tool workers or secondary to rheumatoid arthritis, gout, diabetes mellitus, hypothyroidism and amyloidosis.

CLINICAL FEATURES:

Trigger finger usually will be presenting with,

- Pain at the root of fingers,
- Tenderness,
- Swelling
- Palpable nodule
- uneven movements of the finger while flexion and extension
- catching or popping may occur when extending the finger from
- flexed position and
- In establised cases fixed flexion contracture may be seen at PIP joint level.

CLASSIFICATION OF TRIGGER FINGER:

Many attempts have been made to classify trigger finger, but in one such report by Newport and colleagues, no correlation was found between their grading system and outcome after injection therapy for trigger finger. Several authors have used a grading, originally proposed by Quinnell and modified by David Green.

Grade I (Pre triggering)- Pain; history of catching present, but no demonstrable catching on physical examination; tenderness over the first annular pulley (A1 pulley).

Grade II (Active) - There is demonstrable catching present, but the patient can able to actively extend the digit.

Grade III (Passive) - For demonstrable catching required passive extension (grade IIIA) or unable to actively flex(grade IIIB).

Grade IV (Contracture)- There is demonstrable catching with a fixed flexion PIP joint contracture.

We are using the Froimson grading for assessing the severity of trigger finger,

- Grade I - Pre-triggering –pain; tenderness over the A1pulley; but catching not demonstrable.

- Grade II - Triggering, Active; demonstrable catching, patient can actively extend.
- Grade III- Triggering, Passive; demonstrable catching requiring passive extension or inability to actively flex.
- Grade IV- Contracture; demonstrable catching, with a fixed flexion PIP joint contracture.

RADIOGRAPHIC EVALUATION:

Plain x-ray of Hand- to rule out any bony deformities/anomalies.

SURGICAL APPROACH:

Percutaneous release of trigger finger under ultrasound guidance:-

This procedure is done as an out patient procedure. The palm and affected digit are prepared with antiseptic solution and the finger exposed with a fenestrated drape. The Metacarpophalangeal joints are hyperextended by turning up the palm placing the hand over a rolled towel and it will displace the neurovascular structures dorsally. The first annular pulley (A1 pulley) is palpated directly over the metacarpal head of involved finger.

The skin and flexor tendon sheath are infiltrated with 2 to 3mL of 2% lidocaine solution using a 24-gauge needle (fig.1). A 18-gauge needle is placed percutaneously through the annular pulley, and placement within the flexor tendon is confirmed by ultrasonogram and also by asking the patient to slightly flex the digit.

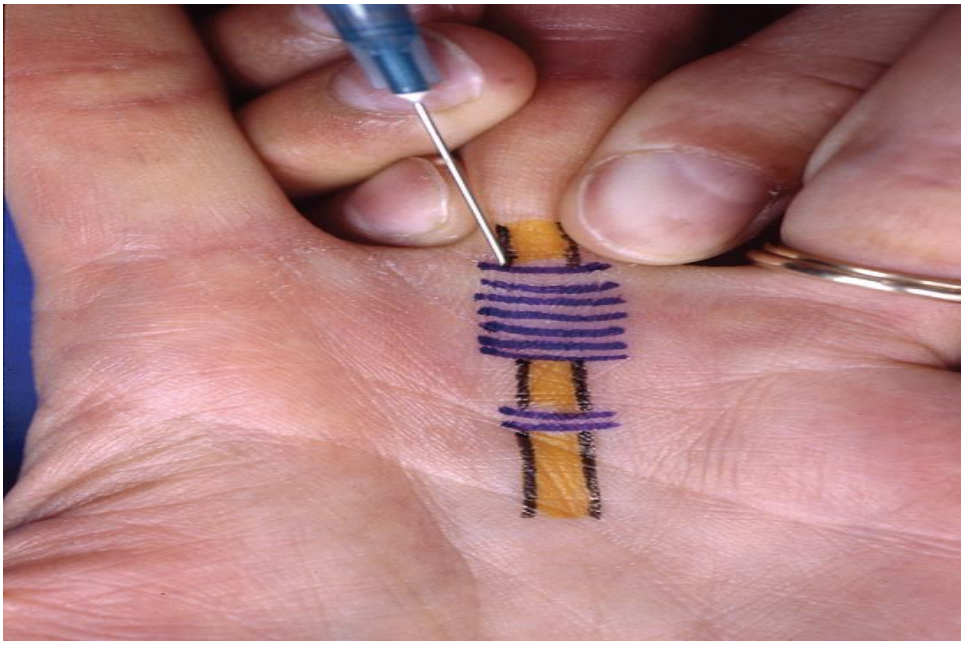


Figure 1

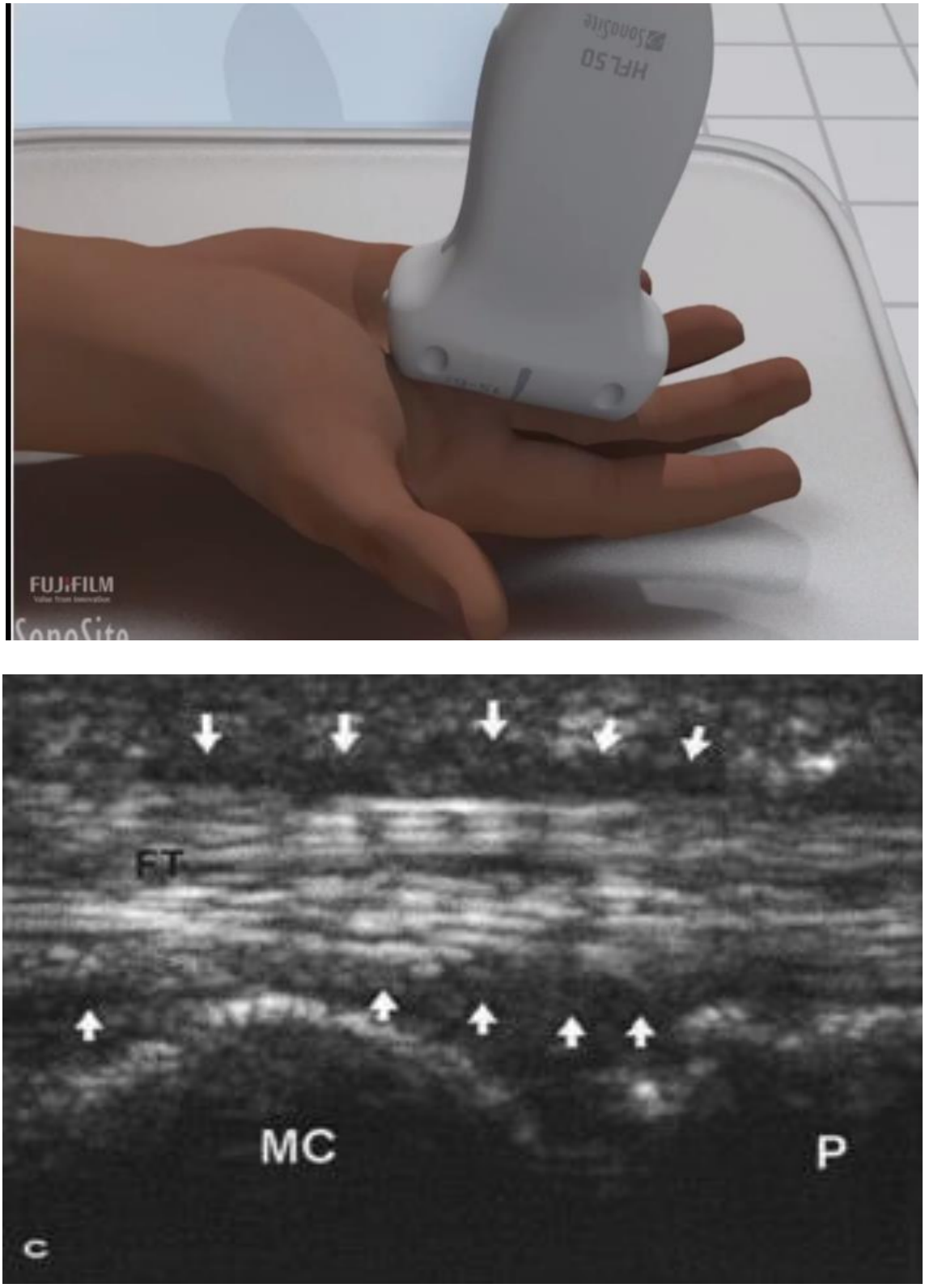


Figure 2. Edematous tendon with thickened A1 pulley and fibrotic Notta nodule visualized under ultrasound in longitudinal position.

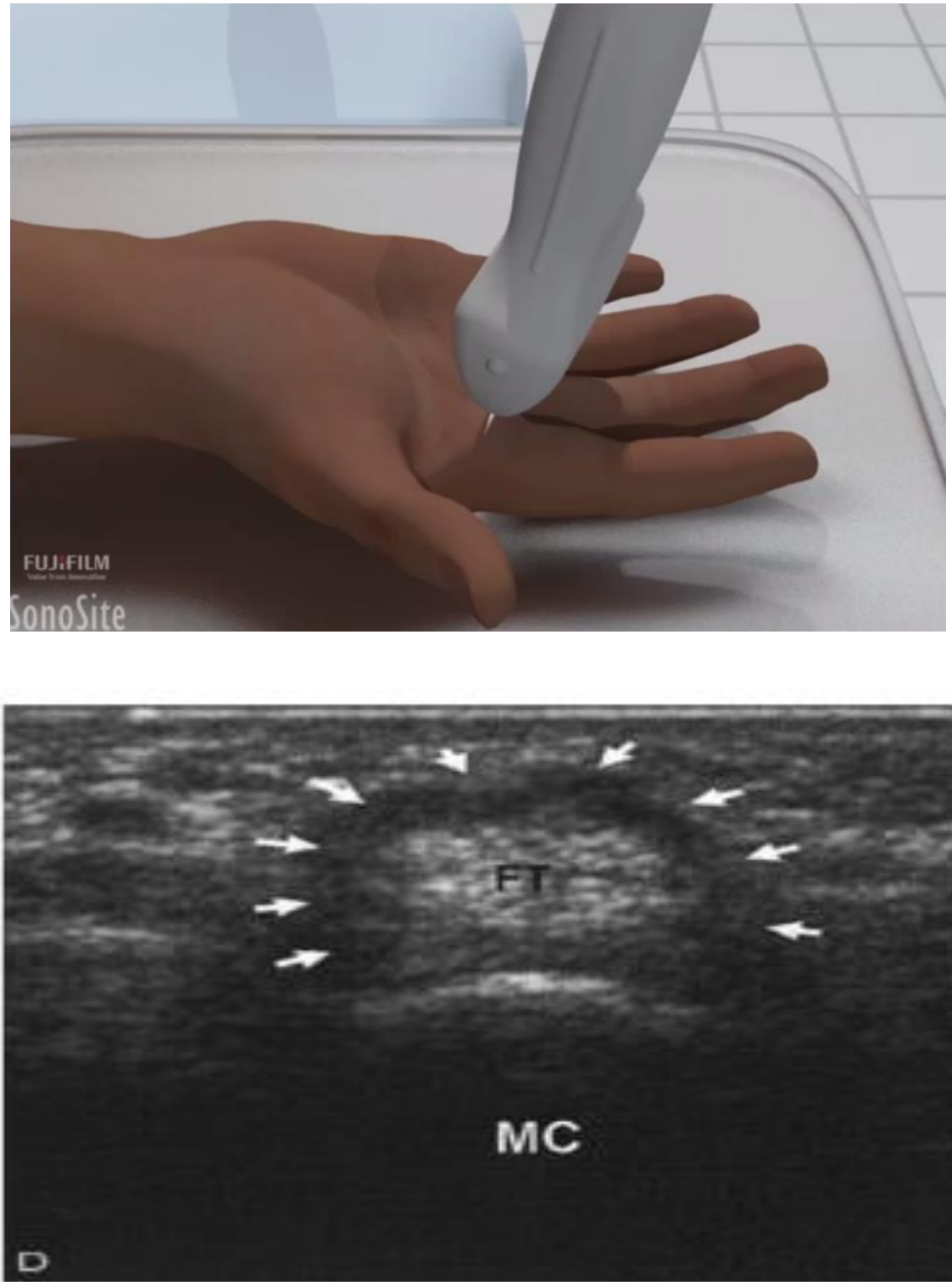


Figure 3. Thickened A1 pulley and Digital nerve and vessels seen on either side of tendon when keeping the ultrasound in horizontal position.

Figure 4

The needle is withdrawn slowly and rotated to align the bevel of the needle in the longitudinal axis of the tendon under the guidance of ultrasound(fig.2). A sweeping motion is used to cut the first annular pulley (A1 pulley) proximal and distal to the site. Disappearance of a grating sensation indicates complete sectioning of the annular pulley and also checked the free movement of tendon over metacarpophalangeal joint under ultrasound guidance. The needle is withdrawn and the patient is asked to flex and extend the digit several times.

An adhesive bandage is applied, and the patient is instructed to use the hand for activities as tolerated. Patients should be advised to expect a mild to moderate degree of discomfort for several days; ice and anti-inflammatory drugs are helpful in the immediate 48 to 72 hours postoperatively.

FUNCTIONAL EVALUATION

- DASH scoring system used (preoperative and postoperatively).
- QUINNELL'S scoring used post operatively.

The Disabilities of the Arm, Shoulder and Hand (DASH) Score

Clinician's name (or ref) ..... Patient's name (or ref .....

INSTRUCTIONS: This questionnaire asks about your symptoms as well as your ability to perform certain activities. Please answer *every question* , based on your condition in the **last week**. If you did not have the opportunity to perform an activity in the past week, please make your *best estimate* on which response would be the most accurate. It doesn't matter which hand or arm you use to perform the activity; please answer based on you ability regardless of how you perform the task.

Please rate your ability to do the following activities in the last week.

1. Open a tight or new jar	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
2. Write	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
3. Turn a key	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
4. Prepare a meal	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
5. Push open a heavy door	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
6. Place an object on a shelf above your head	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
7. Do heavy household chores (eg wash walls, wash floors)	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
8. Garden or do yard work	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
9. Make a bed	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
10. Carry a shopping bag or briefcase	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
11. Carry a heavy object (over 10 lbs)	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
12. Change a lightbulb overhead	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
13. Wash or blow dry your hair	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
14. Wash your back	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
15. Put on a pullover sweater	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
16. Use a knife to cut food	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
17. Recreational activities which require little effort (eg cardplaying, knitting, etc)	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
18. Recreational activities in which you take some force or impact through your arm, shoulder or hand (eg golf, hammering, tennis, etc)	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
19. Recreational activities in which you move your arm freely (eg playing frisbee,	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
20. Manage transportation needs (getting from one place to another)	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
21. Sexual activities	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
22. During the past week, *to what extent* has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups?	Not at all	Slightly	Moderately	Quite a bit	Extremely
23. During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem?	Not limited at all	Slightly limited	Moderately limited	Very limited	Unable
Please rate the severity of the following symptoms in the last week					
24. Arm, shoulder or hand pain	None	Mild	Moderate	Severe	Extreme
25. Arm, shoulder or hand pain when you performed any specific activity	None	Mild	Moderate	Severe	Extreme
26. Tingling (pins and needles) in your arm, shoulder or hand	None	Mild	Moderate	Severe	Extreme
27. Weakness in your arm, shoulder or hand	None	Mild	Moderate	Severe	Extreme
28. Stiffness in your arm, shoulder or hand	None	Mild	Moderate	Severe	Extreme
29. During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand?	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	So much I can't sleep
30. I feel less capable, less confident or less useful because of my arm, shoulder or hand problem	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

The DASH score, a self-administrated questionnaire which includes 30 items related to functional activities and symptoms in activities of daily living (ADL). The patient is asked to attribute a score of 1 to 5 on all 30 items. DASH scores starting from 0 to 100. Scores rise with increasing disability.

POST OPERATIVE SCORING USING QUINNELL'S CRITERIA:

- Grade I - Normal movement, no pain
- Grade II - Normal movement, occasional pain
- Grade III - Uneven movement
- Grade IV - Intermediate locking, actively correctable
- Grade V - Locking, only passively correctable.

Grade I - EXCELLENT

Grade II - GOOD

Grade III–V - POOR.

METHODOLOGY

AIM

A STUDY ON ANALYSIS OF FUNCTIONAL OUTCOME OF PERCUTANEOUS RELEASE IN TRIGGER FINGER UNDER ULTRASOUND GUIDANCE – A NOVEL TECHNIQUE (PROSPECTIVE STUDY).

OBJECTIVES:

- To study the functional outcome of percutaneous release in trigger finger using 18G needle under ultrasound guidance.
- To provide pain-free, effective, safe, convenient procedure for the treatment of trigger finger.

Design: Prospective study.

Period: Aug 2016 to September 2018

Materials and methods:

Sample size: 25 cases were taken up for our study.

INCLUSION CRITERIA:

- Adult Trigger finger – FROIMSON Grade 2,3 &4 who had not responded to conservative treatment
- Recurrent trigger finger inspite of local steroid injection at least for two episodes.
- Patient age from 30 to 70 years.

EXCLUSION CRITERIA:

- Patient not fit for percutaneous release.
- FROIMSON grade 1.
- Bony deformities.
- Diabetic Patients.

Source of Data

- Patients with trigger finger satisfying the inclusion criteria attending OPD *at Govt Rajaji hospital in the dept of Orthopaedic surgery & Traumatology, Madurai* were taken up for study after obtaining informed consent. All the patients selected for study were examined according to protocol, associated comorbities were noted and clinical and lab investigations carried out in order to see the fitness for surgery. Consent of the patient was obtained for procedure. Patients were followed till **good functional out come** is achieved. **Clinically, 25 cases** were studied.

Pre operative preparation:

- Patients underwent a pre-operative evaluation including the following parameters: TC,DC, Hb, ESR, CRP, urea, creatinine, blood sugar,RA factor. Nerve conduction study may be done in patients with any evidence of peripheral nerve involvement.

  X-RAY: Plain xray of Hand to ruled out bony deformities.

INSTRUMENTS:

18 G Needle, ultrasound machine.

Anaesthesia:

Local anaesthesia with lignocaine.

PROCEDURE:

Position -supine position and patient hand in arm table.

Under sterile aseptic precaution, surgical parts painted and drapped.

- The Metacarpophalangeal joints are hyperextended by turn up the palm placing the hand over a rolled towel and it will displace the neurovascular structures dorsally. The first annular pulley (A1 pulley) is palpated directly over the metacarpal head of involved finger.
- The skin and flexor tendon sheath are infiltrated with 2 to 3mL of 1% lidocaine solution using a 24-gauge needle (fig.2.1).

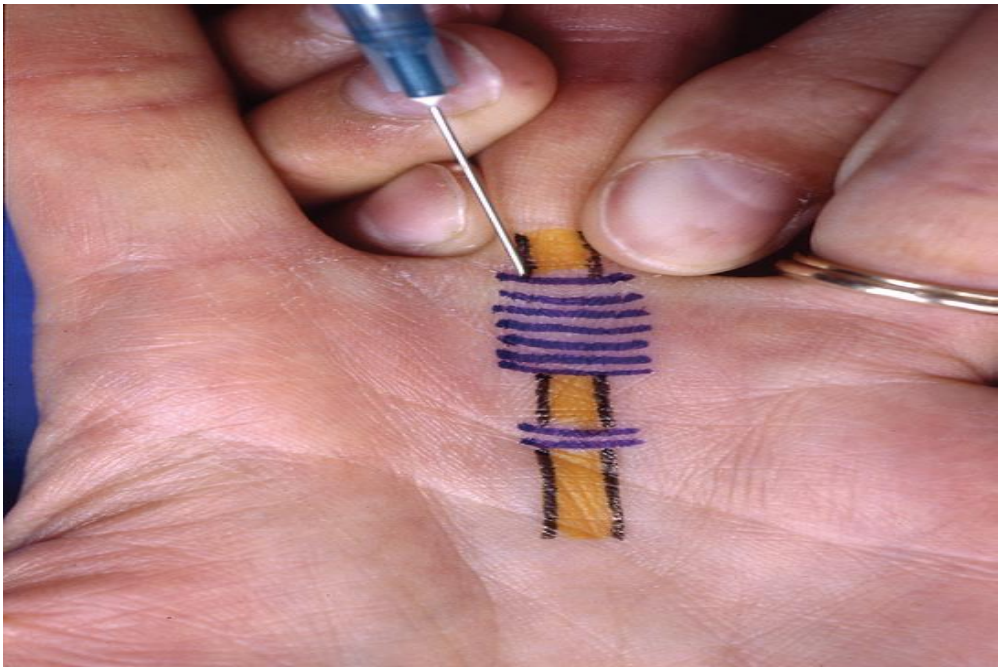


Fig 2.1

A 18-gauge needle is placed percutaneously through the annular pulley, and placement within the flexor tendon is confirmed by ultrasonogram and also by asking the patient to slightly flex the digit. (Fig 2.2).

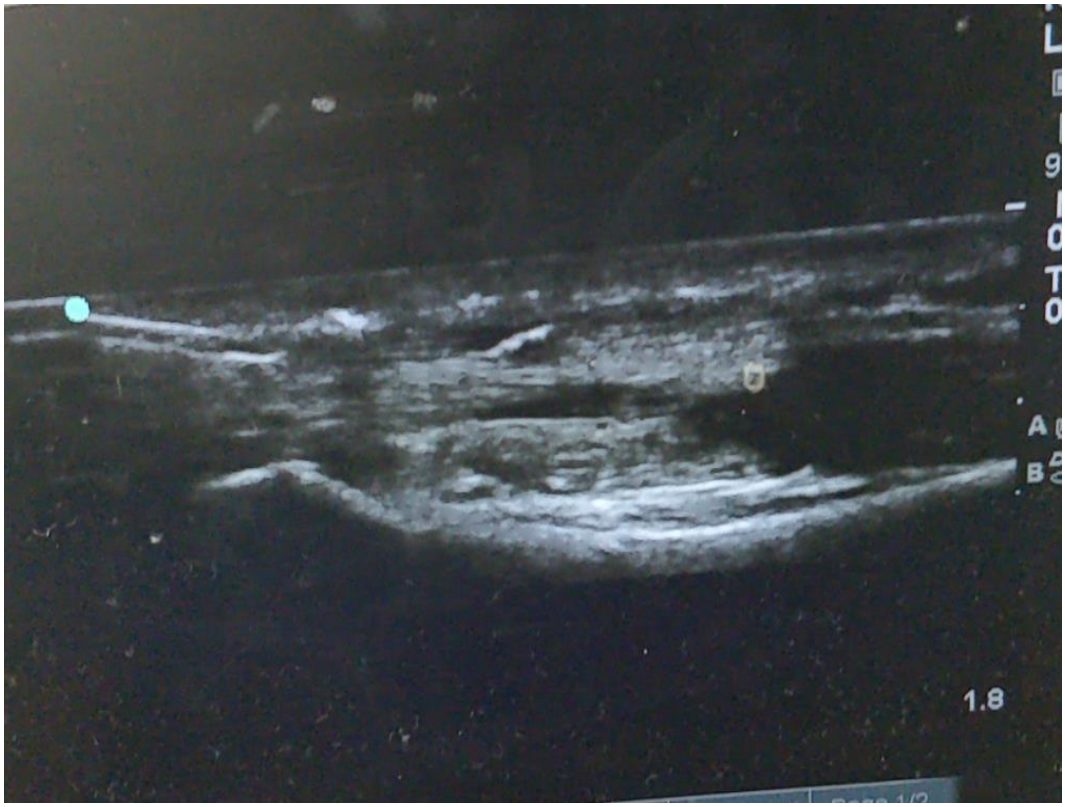


Fig.2.2

- The needle is withdrawn slowly and rotated to align the bevel of the needle along the longitudinal axis of the tendon under the guidance of ultrasound (fig.2.2).
- A sweeping motion is used to cut the first annular pulley (A1 pulley) proximal and distal to the site. Disappearance of a grating sensation indicates complete sectioning of the annular pulley and also checked the free movement of tendon over metacarpophalangeal joint under ultrasound guidance.
- The needle is withdrawn and the patient is asked to flex and extend the digit several times.(fig2.3)

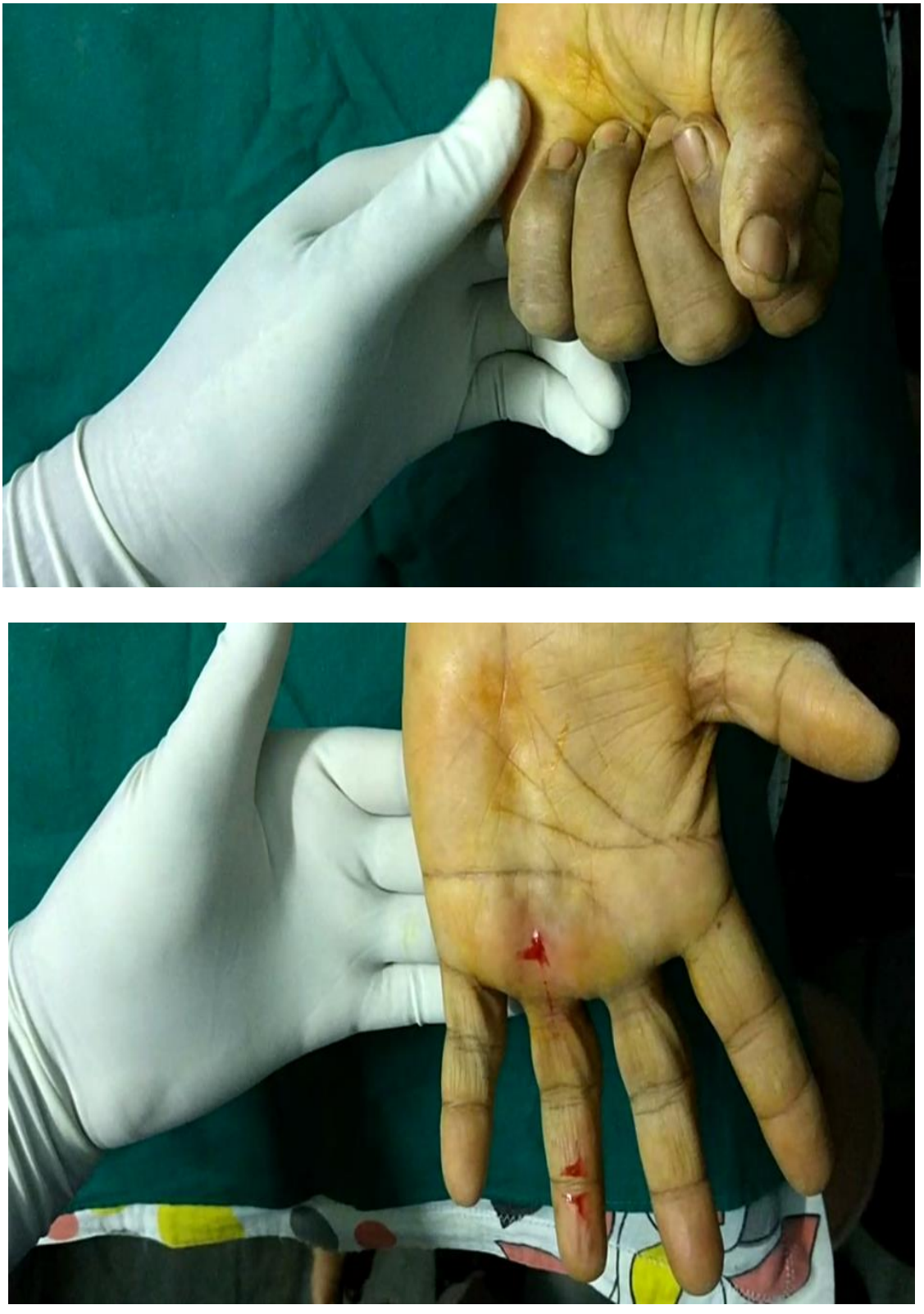


Fig 2.3

- An adhesive bandage is applied, and the patient is instructed to use the hand for activities as tolerated. Patients should be advised to expect a mild to moderate degree of discomfort for several days; ice and anti inflammatory grugs are helpful in the immediate 48 to 72 hours postoperatively.

POST OPERATIVE PROTOCOL:

- FOLLOW UP at 3rd day,7th day,3 weeks, 6 weeks, 12 weeks, 6 months,9 months,12 months,18 months & 24 months.
- Routine analgesics.
- Note for any Complications :

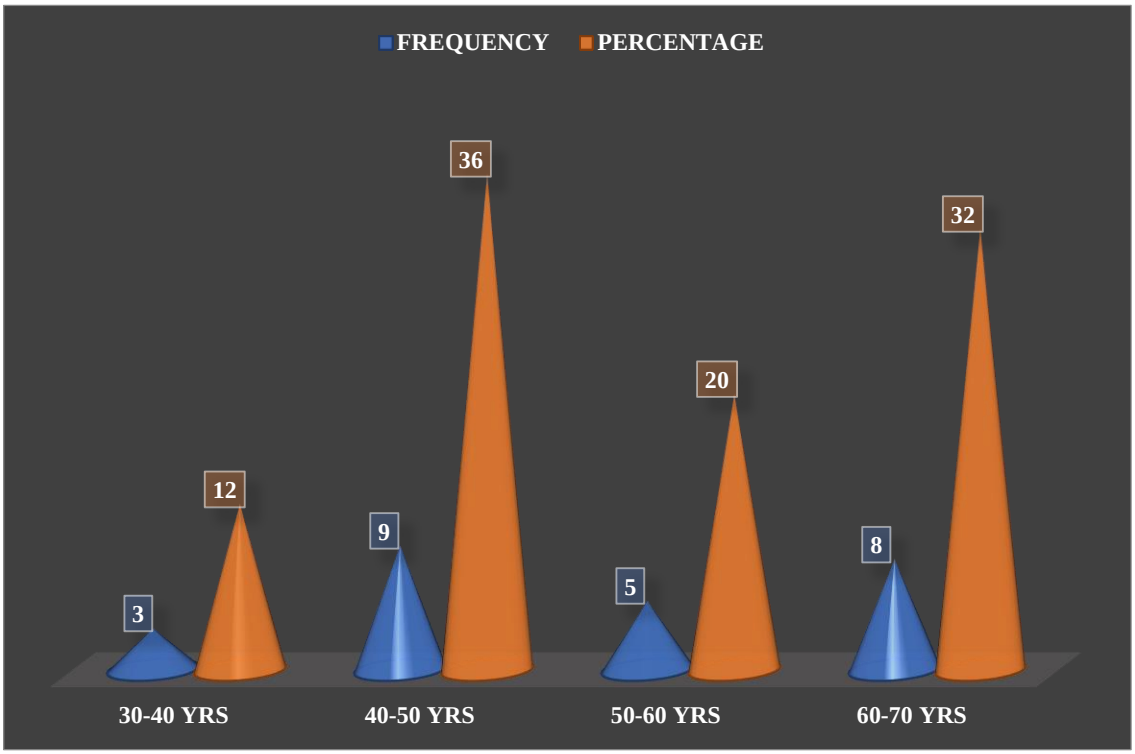
  - Infection
  - Recurrence
  - Digital nerve injury
  - Constant pain.

OBSERVATION & RESULTS

AGE DISTRIBUTION:

Age of the patients ranges from 30-70years with the mean age of 53 years. Among 25 patients studied 48% (12) of patients were 50-70 years of age .it shows increased incidence among older population when compare to young population.

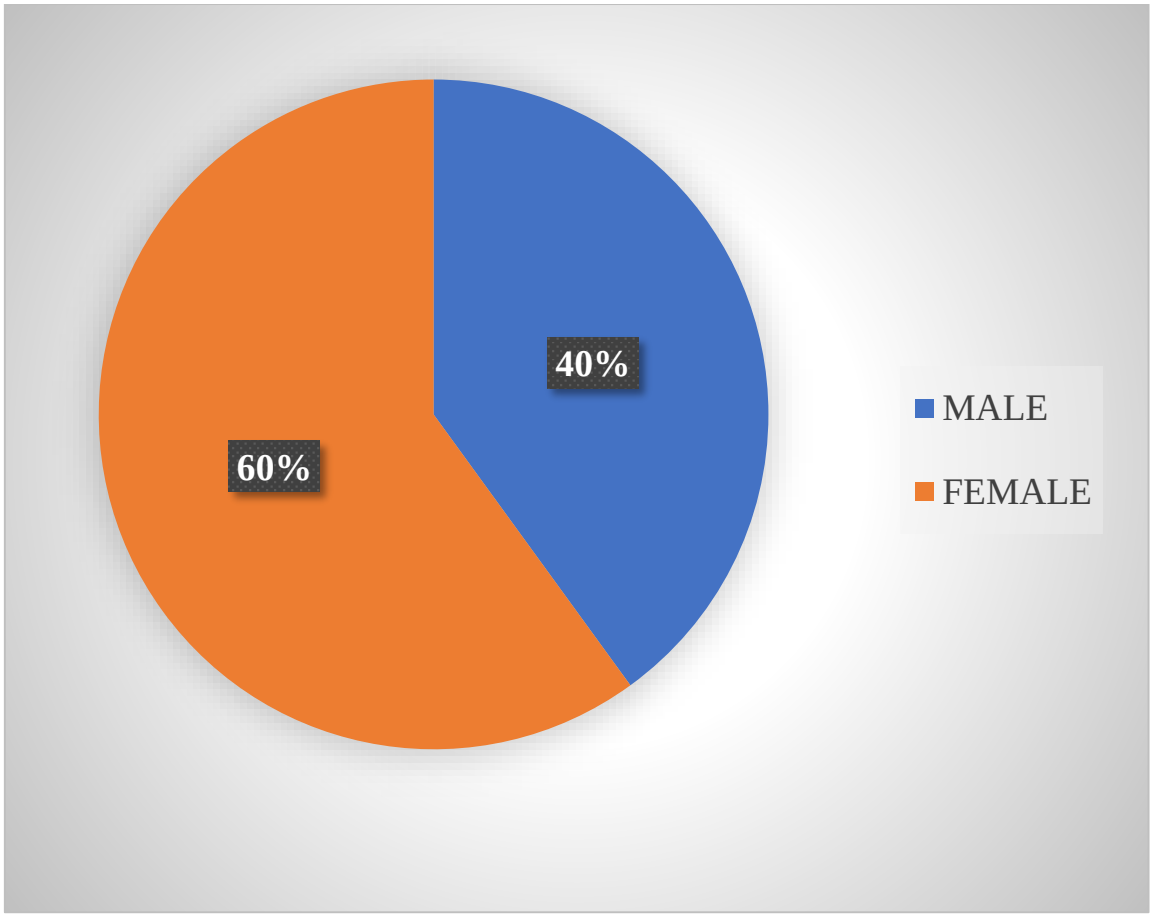
AGE IN YEARS	FREQUENCY	PERCENTAGE
30-40	3	12
51-50	9	36
61-70	5	20
71-80	8	32



SEX DISTRIBUTION:

Out of 25 patients, 10 patients were male and 15 patients were female. It comes around 60 % of female predominance, it reflects the high prevalence among female population.

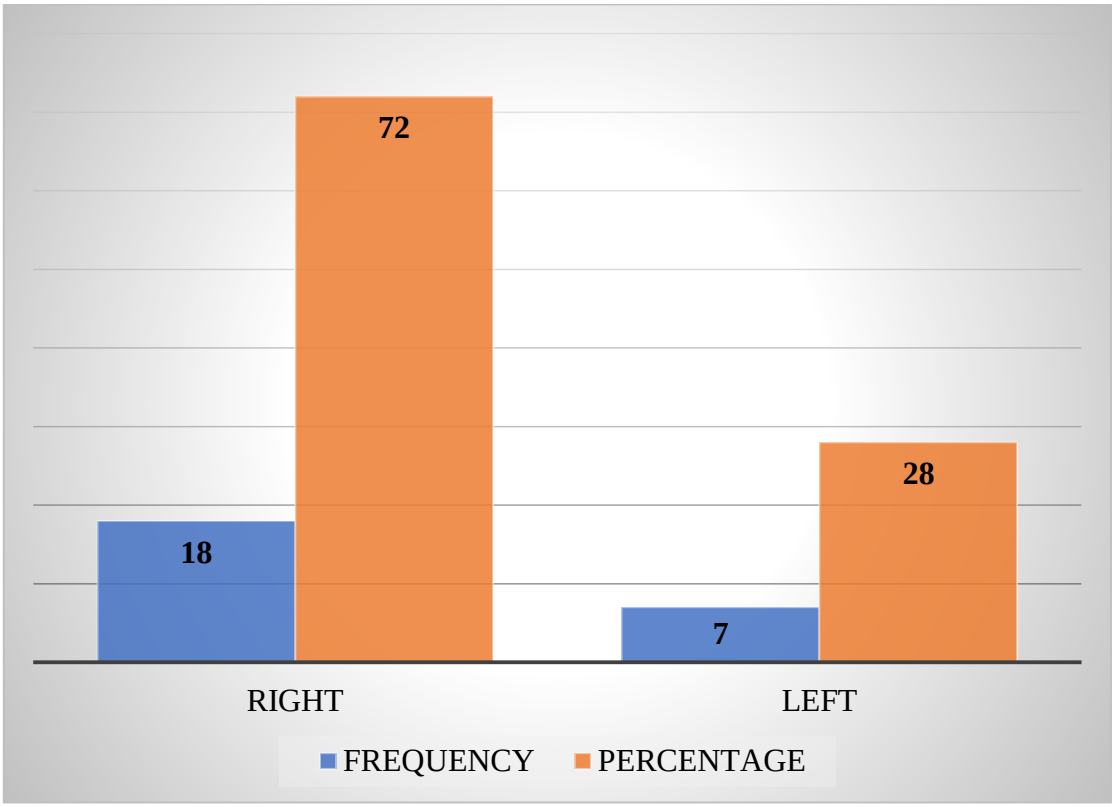
SEX	FREQUENCY	PERCENTAGE
MALE	10	40
FEMALE	15	60



SIDE DISTRIBUTION:

Out of 25 patients studied 18 patients were affected with right hand and 7 were left shand with the percentage of 72% on the right side.

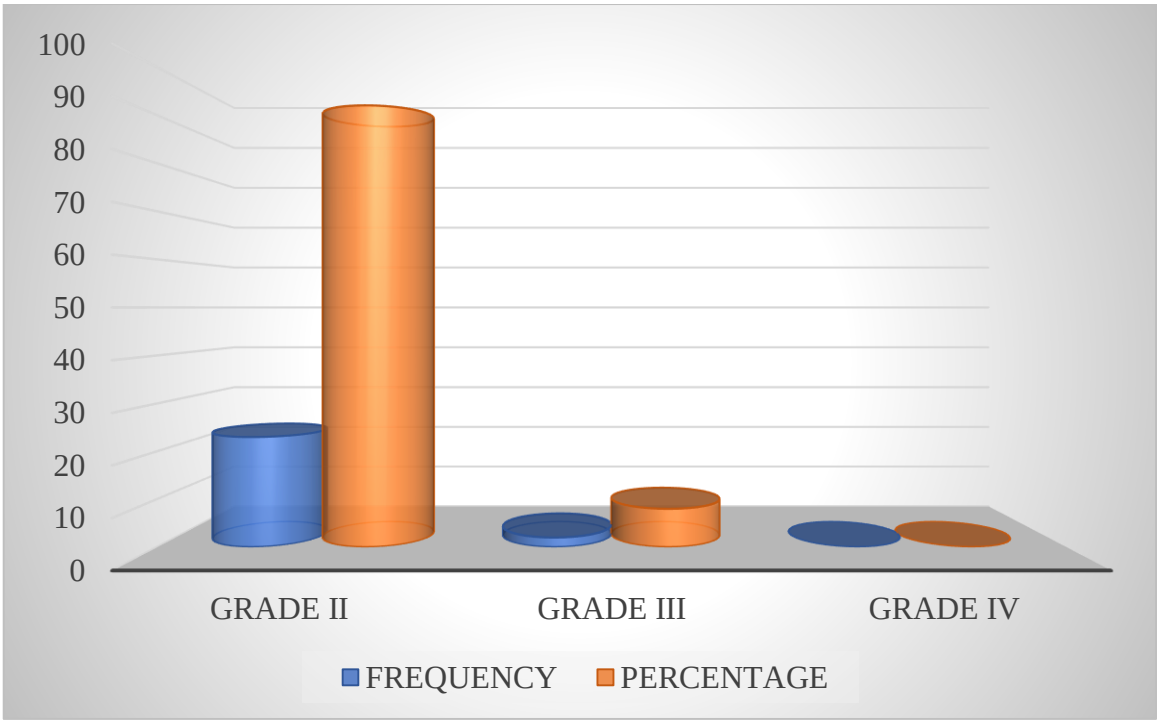
SIDE	FREQUENCY	PERCENTAGE
RIGHT	18	72
LEFT	7	28



FROIMSON GRADE DISTRIBUTION:

Out of 25 patients 23 were Grade II trigger finger and 2 patients was Grade III trigger finger.

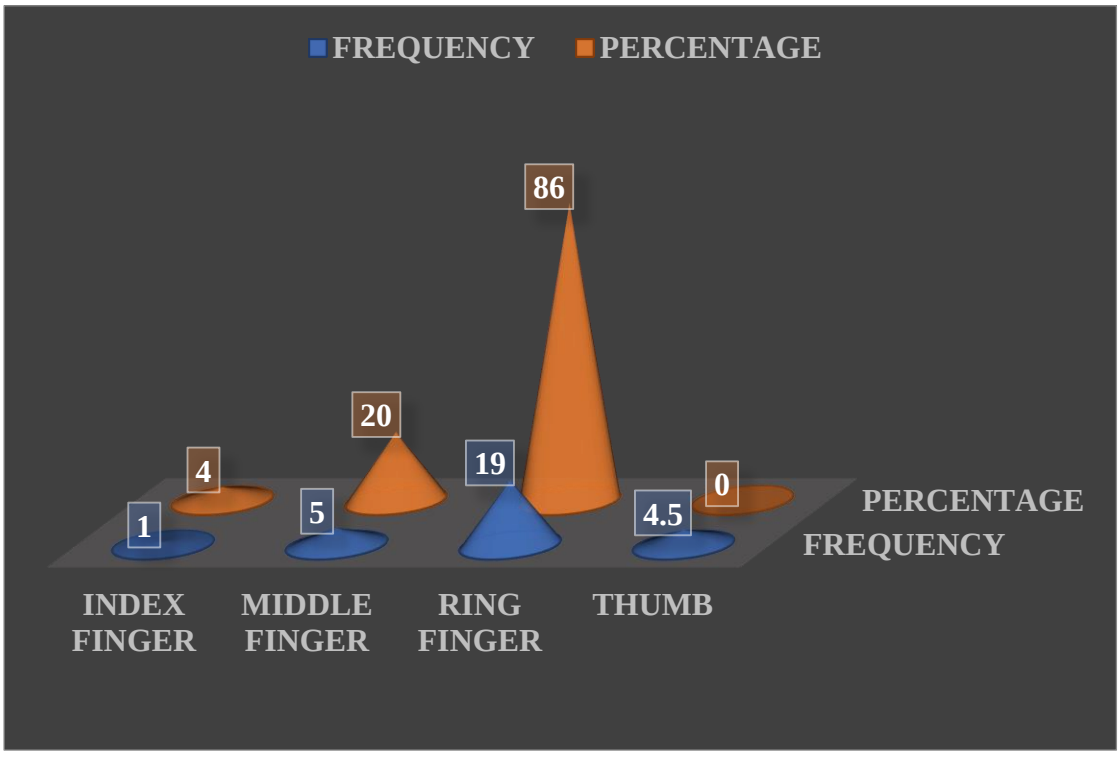
FROIMSON GRADE	FREQUENCY	PERCENTAGE
GRADE II	23	92
GRADE III	2	8
GRADE IV	0	0



FINGER DISTRIBUTION:

Out of 25 patients 19 patients had ring finger involvement,6 patients had middle finger involvement and one patient had index finger involvement.it shows Ring finger involvement is more common than other finger involvement.

FINGER	FREQUENCY	PERCENTAGE
INDEX	1	4
MIDDLE	5	20
RING	19	86
THUMB	0	0



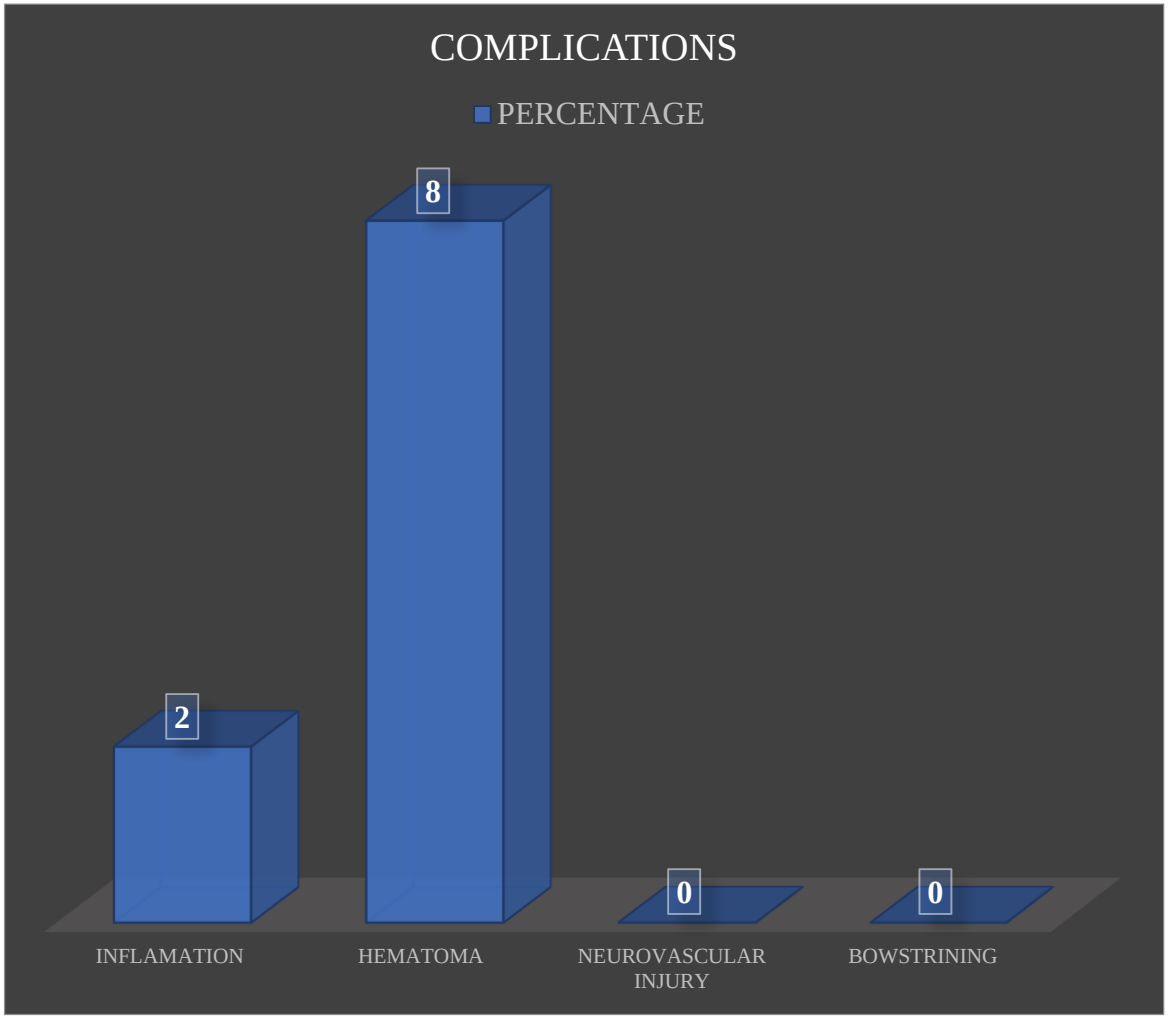
COMPLICATIONS:

Only two complication, first one is hematoma, was observed in two patients; it appeared immediately after the procedure, for which compressive dressing applied and analgesics were given and became less noticeable 1 week later.

Two patients had inflammatory reaction at the needle insertion site, for which antibiotics and analgesics were given and the inflammatory reaction settled with in 10 days period. The same two patients had occasional pain with normal movements of the finger even in the final follow up.

COMPLICATIONS	FREQUENCY	PERCENTAGE
HEMATOMA	2	8
INFLAMATION	2	8
DIGITAL NERVE INJURY	0	0
BOWSTRINGING	0	0

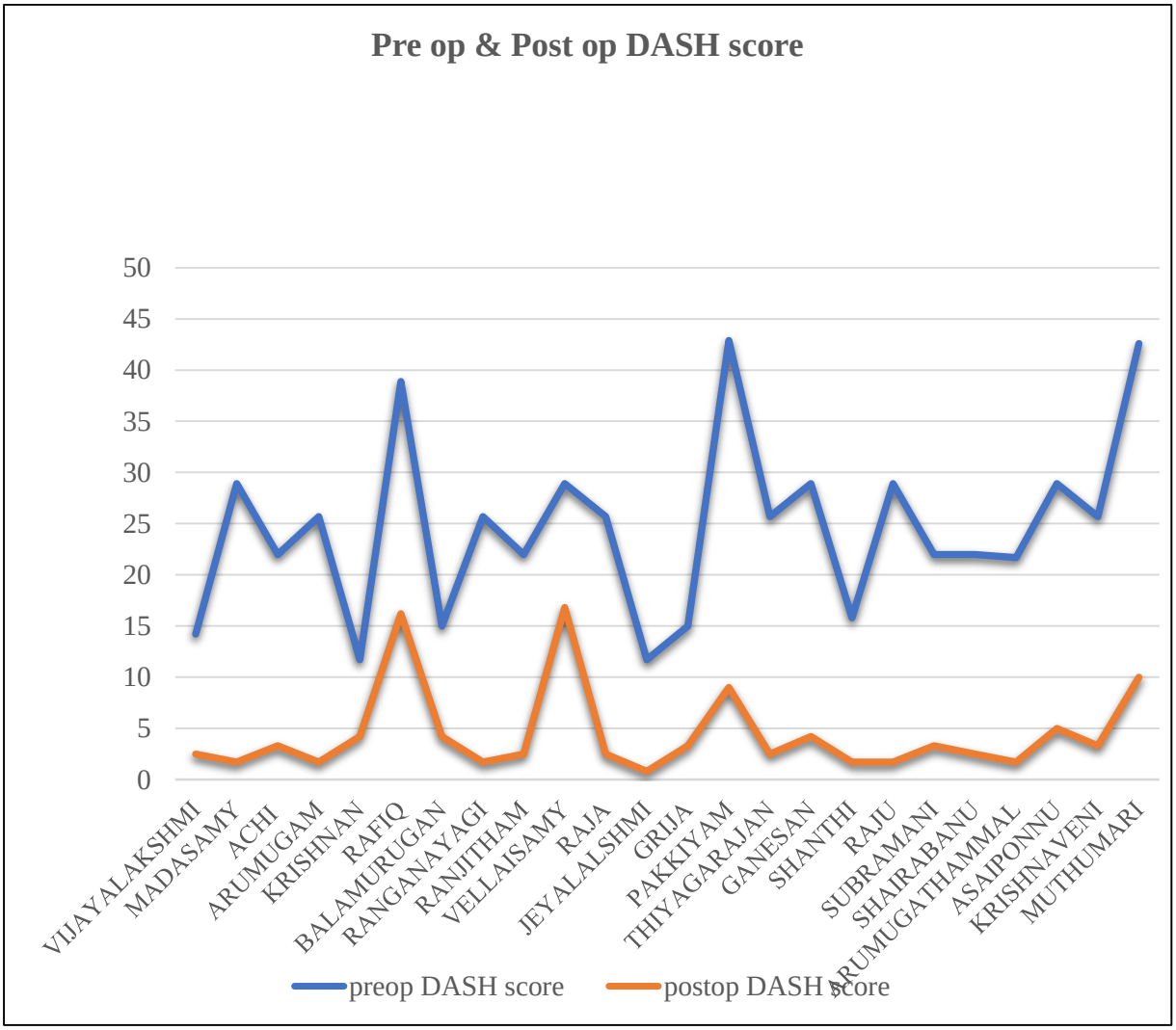
There were no other complications and no clinical signs of damage to the interdigital nerves, flexor tendons, or A2 pulleys and no bowstringing.



PRE OP AND POST OP DASH SCORE:

Post op dash score decreased significantly when compared to pre op which indicates better outcome with the treatment.

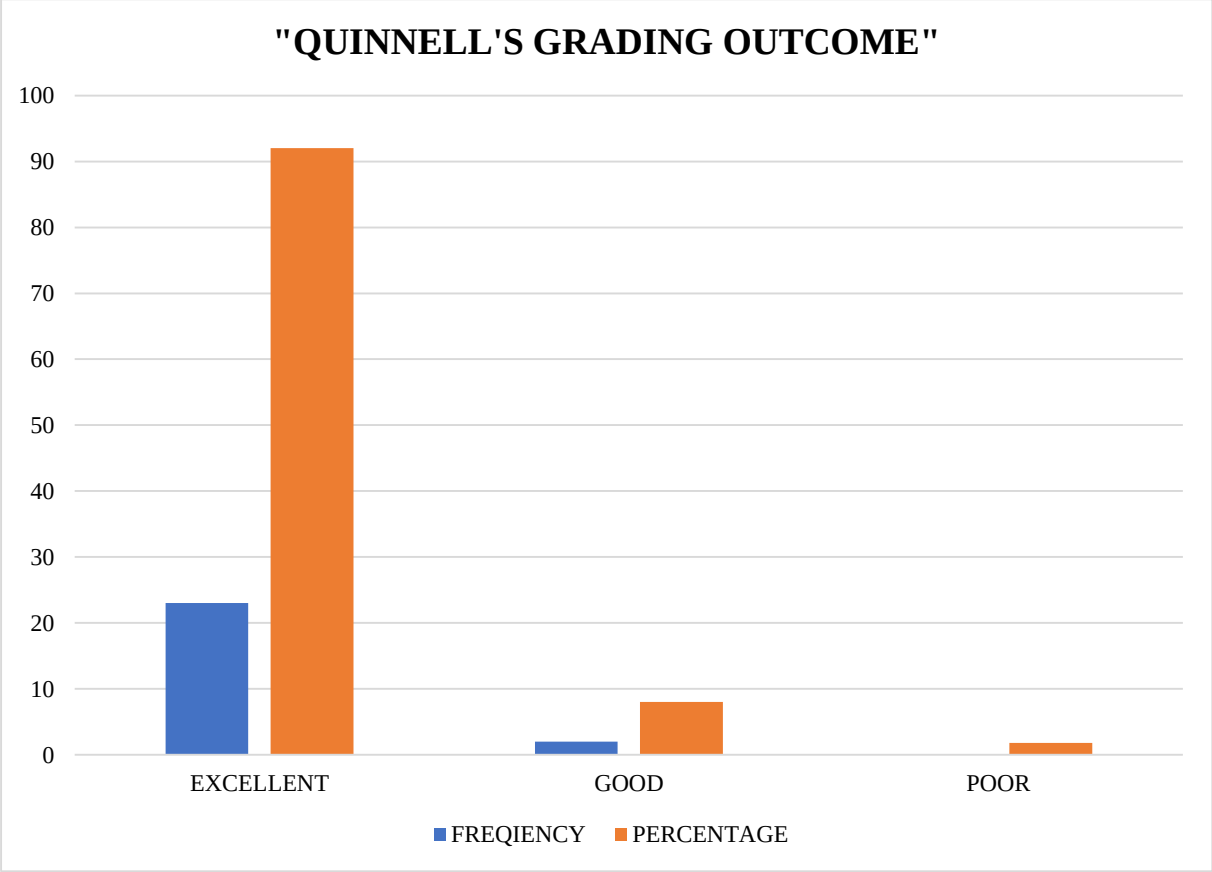
PATIENT NAME	PRE OP DASH SCORE	POST OP DASH SCORE
VIJAYALAKSHMI	14.2	2.5
MADASAMY	28.9	1.7
ACHI	22	3.3
ARUMUGAM	25.7	1.7
KRISHNAN	11.7	4.2
RAFIQ	38.9	16.2
BALAMURUGAN	15	4.2
RANGANAYAGI	25.7	1.7
RANJITHAM	22	2.5
VELLAISAMY	28.9	16.8
RAJA	25.7	2.5
JEYALALSHMI	11.7	0.8
GRIJA	15	3.3
PAKKIYAM	42.9	9
THIYAGARAJAN	25.7	2.5
GANESAN	28.9	4.2
SHANTHI	15.8	1.7
RAJU	28.9	1.7
SUBRAMANI	22	3.3
SHAIRABANU	22	2.5
ARUMUGATHAMMAL	21.7	1.7
ASAIPONNU	28.9	5
KRISHNAVENI	25.7	3.3
MUTHUMARI	42.6	10
KOWSALYA	11.7	2.5


Pre op & Post op DASH score
50
45
40
35
30
25
20
15
10
5
0
VIJAYALAKSHMI
MADASAMY
ACHI
ARUMUGAM
KRISHNAN
RAFIQ
BALAMURUGAN
RANGANAYAGI
RANJITHAM
VELLAISAMY
RAJA
JEYALALSHMI
GRIJA
PAKKIYAM
THIYAGARAJAN
GANESAN
SHANTHI
RAJU
SUBRAMANI
SHAIRABANU
ARUMUGATHAMMAL
ASAIPONNU
KRISHNAVENI
MUTHUMARI
preop DASH score
postop DASH score

QUINNELL'S SCORE OUTCOME ASSESSMENT:

In post op QUINNELL'S score assessment 23 patients had excellent outcome, two patients had good outcome.

QUINNELL'S SCORE	NO OF PATIENTS
GRADE I (EXCELLENT)	23
GRADE II (GOOD)	2
GRADE III-IV(POOR)	0



CASES: **CASE 1**

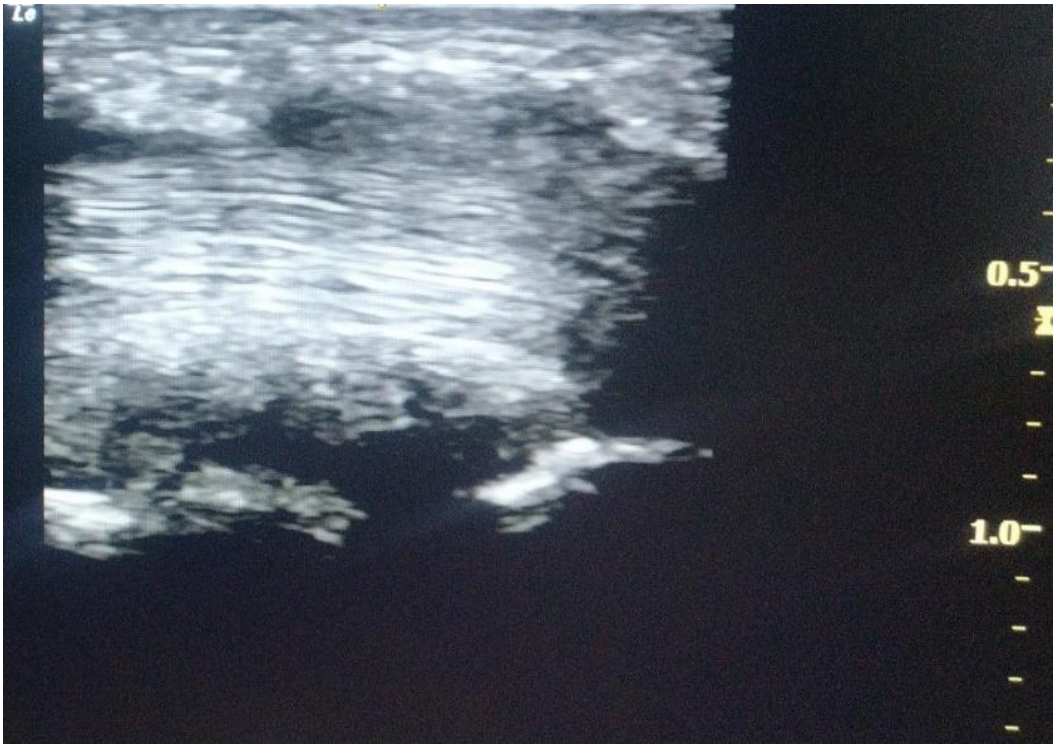
NAME: MRS.VIJAYALAKSHMI

AGE/SEX:38/F

DIAGNOSIS: TRIGGER FINGER, LEFT F4 -FROIMSON GRADE-II.

PRE OP PICTURE

INTRA OP PICTURE



POST OP FOLLOWUP

PRE OP DASH SCORE : 14.2

POST OP DASH SCORE: 2.5

POST OP QUINNELL'S SCORE: EXCELLENT

OUTCOME: EXCELLENT

CASE 2

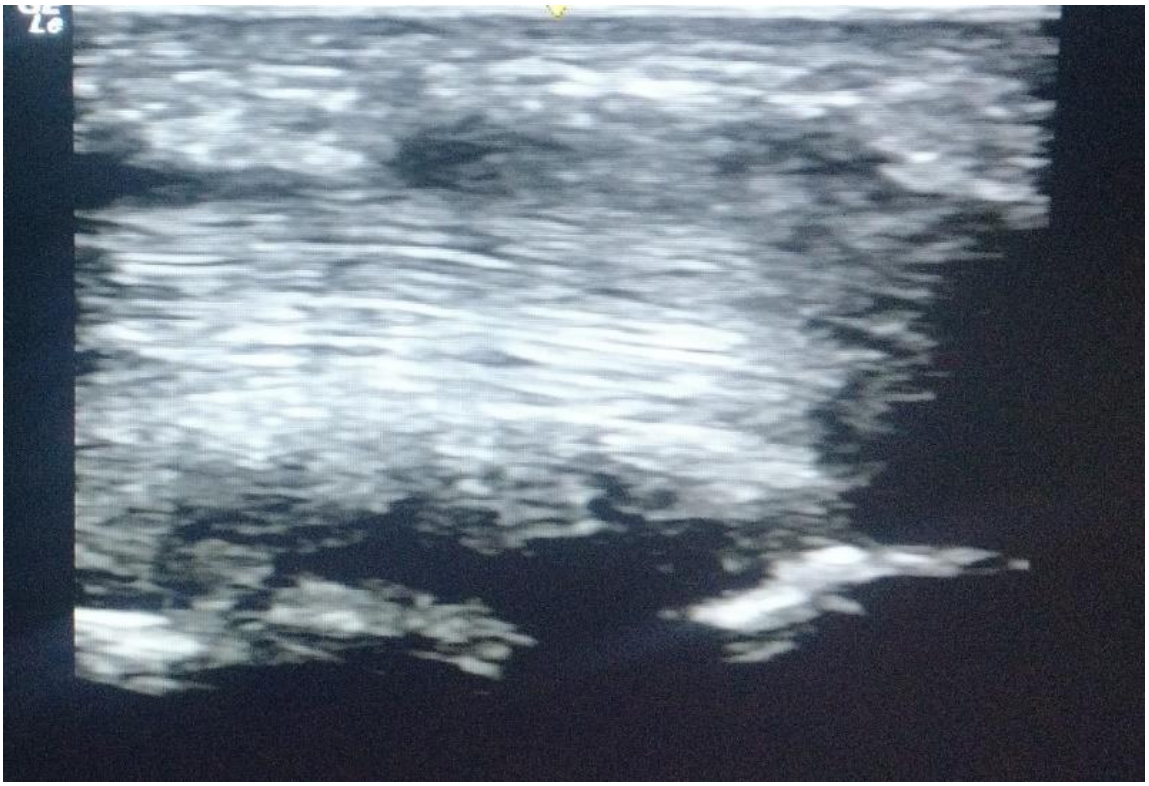
NAME: MRS.GIRIJA

AGE/SEX:38/F

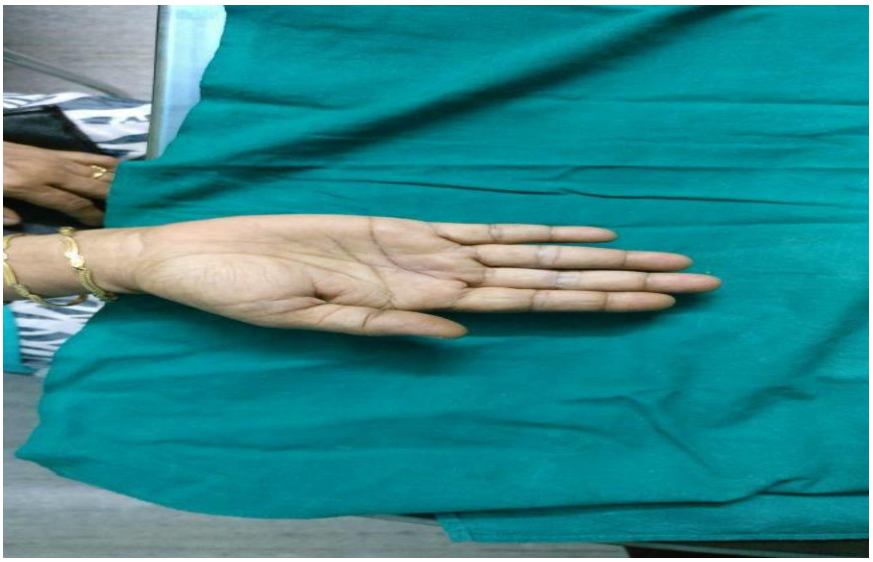
DIAGNOSIS: TRIGGER FINGER, RIGHT F3 -FROIMSON GRADE-II.

PRE OP PICTURE

INTRA OP PICTURE



POST OP FOLLOWUP



PRE OP DASH SCORE: 11.7

POST OP DASH SCORE: 0.8

POST OP QUINNELL'S SCORE: EXCELLENT

OUT COME: EXCELLENT

CASE 3

NAME: MR.RAJA

AGE/SEX: 44/F

DIAGNOSIS: TRIGGER FINGER, RIGHT F4 -FROIMSON GRADE-II

PRE OP PICTURE

PER OP PICTURE

POST OP FOLLOWUP

PRE OP DASH SCORE : 25.7

POST OP DASH SCORE: 2.5

POST OP QUINNELL'S SCORE: EXCELLENT

OUT COME: EXCELLENT

CASE 4

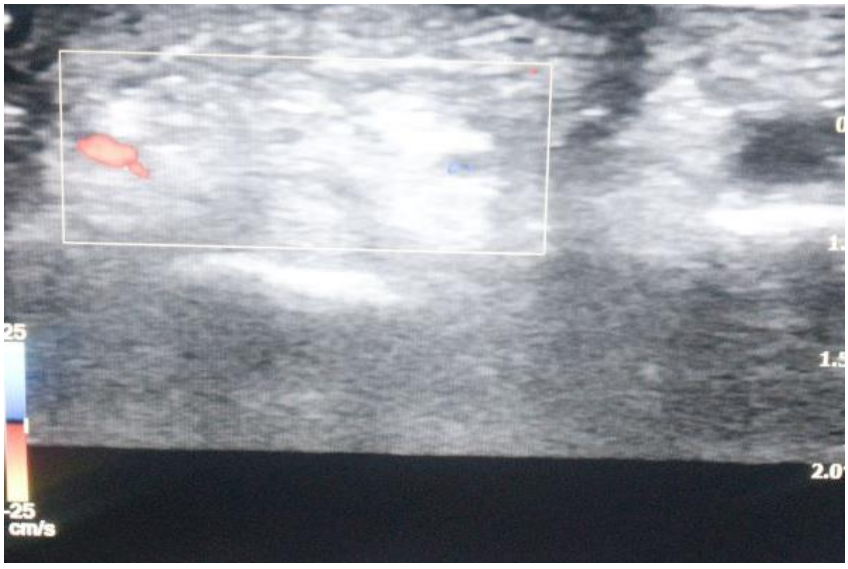
NAME: MRS.MUTHUMARI

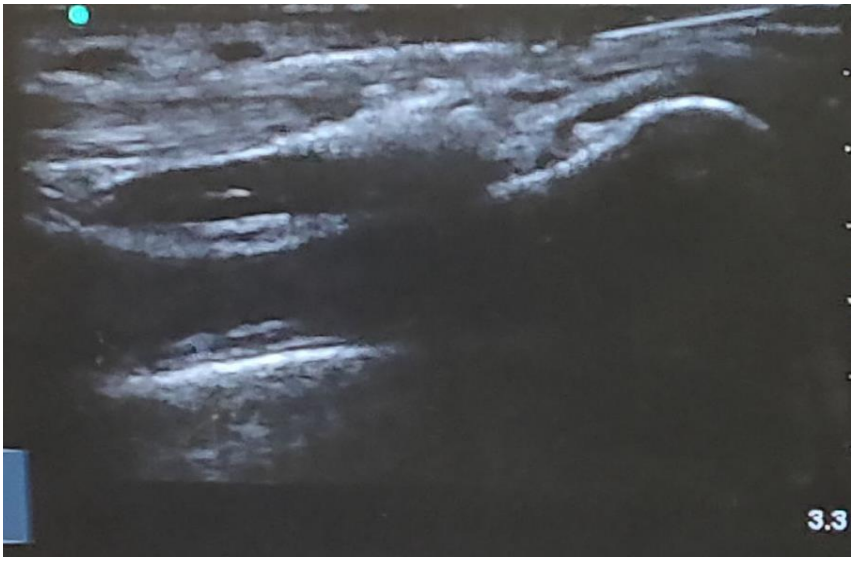
AGE/SEX: 38/F

DIAGNOSIS: TRIGGER FINGER, LEFT F3-FROIMSON GRADE-III

PRE OP PICTURE

INTRA OP PICTURE





POST OP FOLLOWUP

PRE OP DASH SCORE : 42.6

POST OP DASH SCORE: 10

POST OP QUINNELL'S SCORE: EXCELLENT

OUT COME: EXCELLENT

CASE 5

NAME: MRS.PAKKIYAM

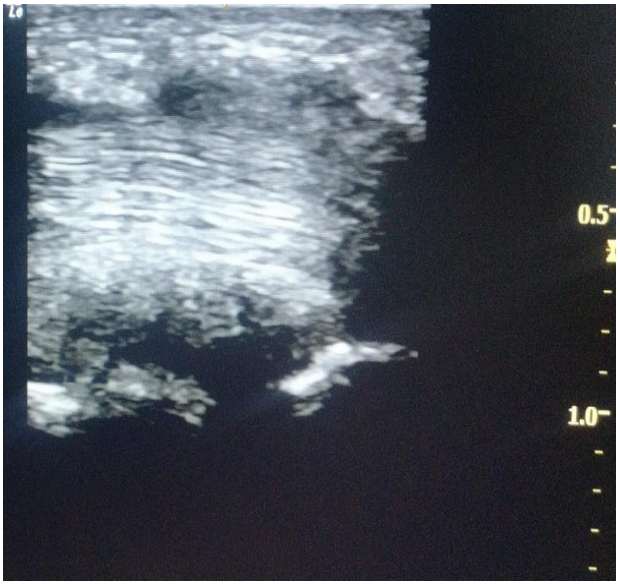
AGE/SEX: 48/F

DIAGNOSIS: TRIGGER FINGER, RIGHT F4 -FROIMSON GRADE-III.

PRE OP PICTURE

X ray RT hand

PER OP PICTURE



POST OP FOLLOWUP

PRE OP DASH SCORE : 42.9

POST OP DASH SCORE: 9

POST OP QUINNELL'S SCORE: EXCELLENT

OUT COME: EXCELLENT

CASE 6

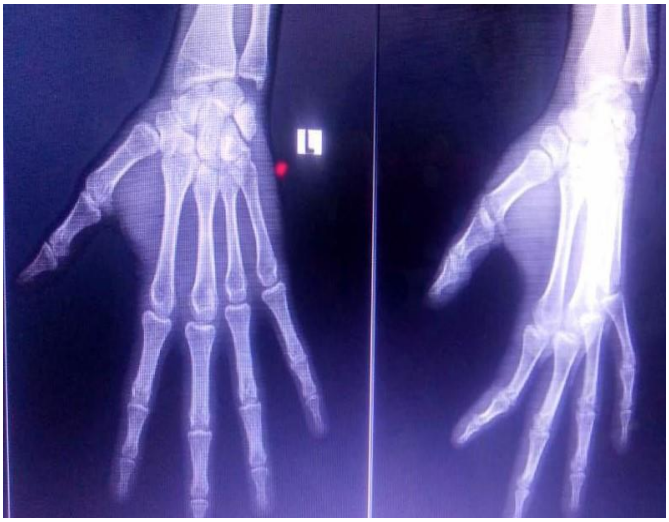
NAME: MRS.RANJITHAM

AGE/SEX: 46/F

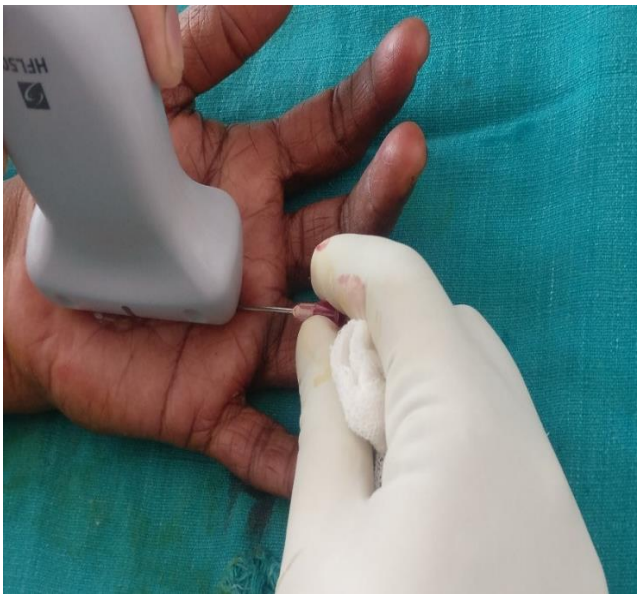
DIAGNOSIS: TRIGGER FINGER, LEFT F4 -FROIMSON GRADE-II.

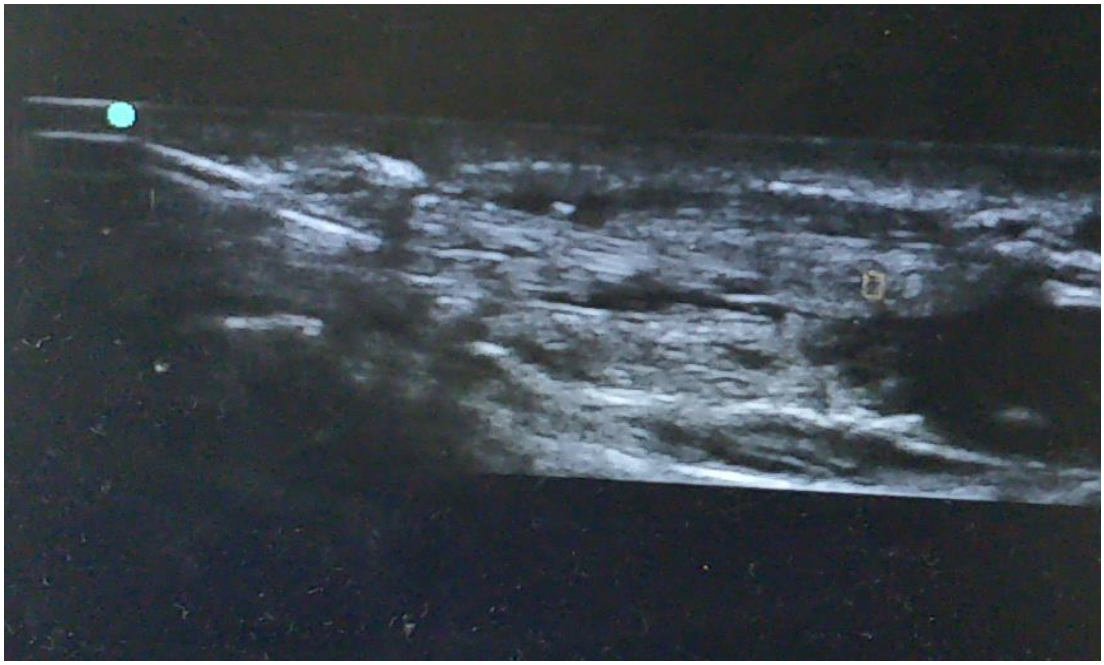
PRE OP PICTURE

X RAY LT HAND



PER OP PICTURE





POST OP PICTURE

FOLLOW UP PICTURE

PRE OP DASH SCORE : 22 POST OP DASH SCORE: 2.5	POST OP QUINNELL'S SCORE: EXCELLENT

OUT COME: EXCELLENT

CASE 7

NAME: MRS.ARUMUGATHAMMAL

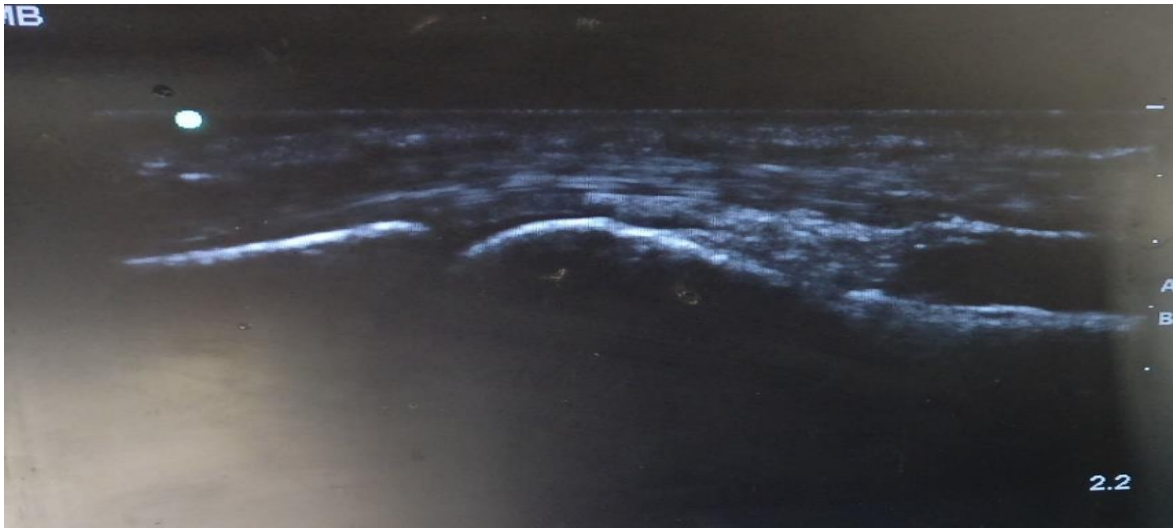
AGE/SEX: 65/F

DIAGNOSIS: TRIGGER FINGER, RIGHT F4 -FROIMSON GRADE-II.

PRE OP PICTURE

XRAY RT HAND

PER OP PICRURE



POST OP PICTURE

POST OP FOLLOW UP

PRE OP DASH SCORE : 21.7

POST OP DASH SCORE: 21.7

POST OP QUINNELL'S SCORE: EXCELLENT

OUT COME: EXCELLENT

COMPLICATIONS:

CASE: 1

NAME: VELLAISAMY

AGE/SEX: 62/M

DIAGNOSIS: TRIGGER FINGER, RIGHT F4-FROIMSON GRADE II

PREOP PICTURE

PER OP PICTURE

POST OP PICTURE

POST OP FOLLOWUP

INFLAMATION

PRE OP DASH SCORE : 28.9

POST OP DASH SCORE: 16.8

POST OP QUINNELL'S SCORE: GOOD

OUTCOME: GOOD

CASE 2

NAME: MR.RAFIQ

AGE/SEX: 46/M

DIAGNOSIS: TRIGGER FINGER RIGHT F4-FROIMSON GRADE II

PRE OP PICTURE

XRAY RT HAND

PER OP PICTURE

POSTOP FOLLOW UP

INFLAMATION

PRE OP DASH SCORE : 38.9

POST OP DASH SCORE: 16.2

POST OP QUINNELL'S SCORE: GOOD

OUTCOME: GOOD

RESULTS

Total no of Trigger finger with Froimson grade II to IV patients came to outpatient department in our hospital and selected for this procedure were 30 patients out of which 5 patients were not willing for surgery, hence they were excluded from study. 25 patients were operated with this procedure, 10 male & 15 female patients. It shows the prevalence of trigger finger is increased among female patients.

Age of the patient ranges from 30-70years with the mean age of 53 years. Among 25 patients studied 48% (12) of patients were 50-70 years of age. It shows increased incidence in older population when compared to younger population.

In this study 18 patients were affected on Right side and 7 patients were on left side. Right sided involvement was more in our study. Most of the cases are of primary etiology.

Post operative rehabilitation was started according to the protocol. All the patients were followed up to 2 years at regular 3 months interval to assess the functional outcome.

Functional outcome by DASH score and QUINNELL'S Grading score.

DASH score is 100 point score, 30 questionnaire related daily activities. Lower the score better is the outcome. In our study, pre operative mean

DASH score was 24.09 and post op mean DASH score was 3.99. It indicates that the percutaneous release of A1pulley in trigger finger improve the outcome of hand functions.

QUINNELL'S Grading score using clinical assessment for severity of triggering after the procedure. Grade I as Excellent, Grade II as Good, Grade III- V as poor outcome.

According to QUINNELL'S Grading to 23 patients had excellent outcome, 2 patients had good outcome and none of the patients had poor outcome in our study.

Total no. of complications are two. Two patients had inflammation at the procedure site. This was settled with analgesics and antibiotics within a week time, but the same 2 patients had occasional pain at the release site in the follow up period. Another two patients had hematoma following surgery for which compression dressing and analgesic were given. Hematoma got settled with in 5 to 7 days period.

DISCUSSION:

Trigger finger is a common, debilitating condition of hand with incidence rates 2.2% in general population more than 30 years and 10% in the diabetes mellitus populations.

It is more common in healthy middle aged women with a frequency of two to six times than that seen in men. The incidence increases with increasing age, to a peak in the fifth or sixth decade of life. It commonly involves the thumb, followed by the ring, long, little, and index fingers in multi digit involvement.

Froimson grade I trigger finger, mostly treated by conservative management with analgesics, splinting and physiotheraphy. In Froimson grade II ,III & IV, after the conservative treatment and steroid injections are fail, it needs surgical procedures. Traditional open surgical procedure is performed by cutting the A1 pulley via a longitudinal or transverse incision. This technique has been used for a long time.

However the surgical procedures can present with unacceptable complications like impaired wound healing, bleeding, infection, and neurovascular injury. Even in healthy patients, for surgical procedure it needs significant recovery time, wound care, rehabilitation, and cost.

Lange-Riess *et al*., observed from their open surgery series for 305 trigger finger cases reported only a total of 9 complications, including 2

superficial wound infections,1 delayed wound healing, and 6 temporary digital sensory losses. No permanent complications were detected after 14-year follow-up period.

Percutaneous trigger finger release of A1 pulley offers an alternative to open surgery. Ultrasound visualization ensures placement of needle under the first annular (A1) pulley, above the flexor tendon and away from the neurovascular structures. It can be done as an outpatient procedure, and post procedural care is nil. Patients may return to normal activities the next day.

Eastwood *et al*, performed the percutaneous surgical release technique as a convenient, cost-effective procedure with a low complication rate.This is becoming more popular than open surgery. He suggested Percutaneous release with an aim to reduce the complications that can be seen with open release surgery, such as infections, painful scar formation,bowstringing of the flexor tendons due to pulley damage, weakness, joint stiffness, and digital neurovascular damage.

Ha KI *et al*. reported, no complications after their 185 Percutaneous release procedures. Wang HC did a retrospective study comparing 32 open surgical release cases and 40 Percutaneous release cases. No statistical clinical differences between these two procedures were detected. The results suggested that percutaneous release is a satisfactory alternative to open release.

Gilberts et al., observed in his long-term comparative study indicated outstanding results for both techniques. It is important to minimize the risk of A2 pulley injury during percutaneous trigger finger release. Flexor tendon bow stringing as a result of excessive A2 pulley injury (>25% of its length) is a well established, though uncommon, complication of open trigger finger releases. Using sonographically guided percutaneous needle techniques, did not observe any A2 pulley injury.

In 1958 Lorthioir first described the percutaneous trigger finger release. He advocated repeatedly as it is an alternative to open release. The proponents of this technique argue that it provides safe division without the need for incisions, resulting in decreased post-operative pain and fast recovery. Furthermore, most of them feel that it decreases costs, as it can be performed quickly with local anaesthesia. Controversy persists regarding the safety and efficacy of this procedure. Despite the proposed advantages, percutaneous trigger finger release has not gained widespread acceptance due to concerns with injury to the tendon or neurovascular bundle during this blind procedure, inaccuracy of topographical landmarks, and potential for incomplete release.

In an innovative attempt to improve the safety of Percutaneous trigger finger release, Jou and Chern introduced usg guided imaging as an adjunct for guiding the needle. Their series reported 97% of patients with complete resolution of symptoms and what they subjectively felt was increased safety.

All the patients were operated only after obtaining informed consent. 25 patients were operated under local anaesthesia. Using the ultrasound for needle insertion and percutaneous release of A1pulley.

Post-operative rehabilitation done according to the protocol. Patients were followed up to two years to assess the pain, infections, severity of triggering recurrence using Quinnell's criteria and neurovascular injury. Quinnell's criteria and DASH scoring was used to assess the functional outcome of percutaneous trigger finger release.

ADVANTAGES:

1) It is a day care procedure.
2) Minimally invasive
3) Minimal or No damage to digital nerves and vessels
4) No stitches needed
5) Less expensive
6) Procedure with good results in short term rehabilitation.

CONCLUSION

In conclusion, ultrasound -guided percutaneous release of the A1 pulley in trigger finger is achievable with an 18-gauge needle. The procedure is painless, quick, risk-free, low cost and requires almost no time off work, and can be performed on at-risk patients and as an out patient procedure. The trigger digit resolved immediately and providing satisfactory results for all patients.

In our study, Trigger finger Percutaneous release of first annular pulley (A1 pulley) under ultrasound-guidance is a safe, pain free, effective and outpatient procedure for patients with Trigger finger. It is a better alternative to open surgical procedure and can be considered as primary definitive treatment option for trigger finger.

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STUDY PROFORMA:

"A PROSPECTIVE STUDY ON ANALYSIS OF FUNCTIONAL OUTCOME OF PERCUTANEOUS RELEASE IN TRIGGER FINGER UNDER ULTRASOUND GUIDANCE – A NOVEL TECHNIQUE"

NAME :

AGE/SEX :

OP/I.P NO :

OCCUPATION :

MODE/DURATION :

ASSOCIATED CONDITION:

DIABETES MELLITUS : YES / NO

RHEUMATOID ARTHRITIS : YES / NO

SYSTEMIC HYPERTENSION : YES / NO

DIAGNOSIS :

FROIMSON GRADE :

PRE OP DASH SCORE:

HISTORY OF PREVIOUS TREATMENT:

CONSERVATIVE : YES / NO

LOCAL STEROID INJECTION : YES / NO

PRE PROCEDURE ULTRASOUND FINDINGS:

INTRA & POST PROCEDURE USG FINDINGS:

DATE OF THE PROCEDURE:

ANAESTHESIA:

USE OF TOURNIQUET:

POST OP PERIOD:

	Immediate Post OP	3 wks	6 wks	3 Months	6 Months	9 Months	1yr	1½ yrs	2 Yrs
QUINNELL'S GRADING									

DASH SCORE AT FOLLOW UP:

COMPLICATIONS IF ANY:

DIGITAL NERVE INJURY:

INFECTION :

RECURRENCE :

CONSTANT PAIN :

CONSENT FORM

FOR OPERATION/ANAESTHESIA

I_____ Hosp. No._____ in my full senses hereby give my full consent for _____ or any other procedure deemed fit which is a diagnostic procedure / biopsy / transfusion / operation to be performed on me / my son / my daughter _____age under any anaesthesia deemed fit. The nature,risks and complications involved in the procedure have been explained to me in my own language and to my satisfaction. For academic and scientific purpose the operation/procedure may be photographed or televised.

Date:

Signature/Thumb Impression

Name of Patient/Guardian:

Designation Guardian Relation ship

Full address

MASTER CHART

S. No	NAME	Age	Sex	Froimson Grade	Side/ Finger	Preop Dash Scoring	Preop Neurological Status	Postop Quinnell's Grade Outcome	Postop Dash Scoring	Postop Neurologcal Status
1	VIJAYALAKSHMI	38	F	II	LEFT/F4	14.2	INTACT	EXCELLENT	2.5	INTACT
2	MADASAMY	70	M	II	LEFT/F3	28.9	INTACT	EXCELLENT	1.7	INTACT
3	ACHI	62	F	II	RIGHT/F4	22	INTACT	EXCELLENT	3.3	INTACT
4	ARUMUGAM	61	F	II	LEFT/F3	25.7	INTACT	EXCELLENT	1.7	INTACT
5	KRISHNAN	70	M	II	LEFT/F4	11.7	INTACT	EXCELLENT	4.2	INTACT
6	RAFIQ	46	M	II	RIGHT/F4	38.9	INTACT	GOOD	16.2	INTACT
7	BALAMURUGAN	45	M	II	RIGHT/F2	15	INTACT	EXCELLENT	4.2	INTACT
8	RANGANAYAGI	57	F	II	LEFT/F4	25.7	INTACT	EXCELLENT	1.7	INTACT
9	RANJITHAM	46	F	II	LEFT/F4	22	INTACT	EXCELLENT	2.5	INTACT
10	VELLAISAMY	62	M	II	RIGHT/F4	28.9	INTACT	GOOD	16.8	INTACT
11	RAJA	44	M	II	RIGHT/F4	25.7	INTACT	EXCELLENT	2.5	INTACT
12	JEYALALSHMI	52	F	II	LEFT/F4	11.7	INTACT	EXCELLENT	0.8	INTACT
13	GRIJA	42	F	II	RIGHT/F3	15	INTACT	EXCELLENT	3.3	INTACT
14	PAKKIYAM	48	F	III	RIGHT/F4	42.9	INTACT	EXCELLENT	9	INTACT
15	THIYAGARAJAN	48	M	II	RIGHT/F4	25.7	INTACT	EXCELLENT	2.5	INTACT
16	GANESAN	55	M	II	RIGHT/F4	28.9	INTACT	EXCELLENT	4.2	INTACT
17	SHANTHI	42	F	II	RIGHT/F4	15.8	INTACT	EXCELLENT	1.7	INTACT
18	RAJU	66	M	II	RIGHT/F4	28.9	INTACT	EXCELLENT	1.7	INTACT
19	SUBRAMANI	68	M	II	RIGHT/F4	22	INTACT	EXCELLENT	3.3	INTACT
20	SHAIRABANU	48	F	II	RIGHT/F3	22	INTACT	EXCELLENT	2.5	INTACT
21	ARUMUGATHAMMAL	65	F	II	RIGHT/F4	21.7	INTACT	EXCELLENT	1.7	INTACT
22	ASAIPONNU	58	F	II	RIGHT/F4	28.9	INTACT	EXCELLENT	5	INTACT
23	KRISHNAVENI	54	F	II	RIGHT/F4	25.7	INTACT	EXCELLENT	3.3	INTACT
24	MUTHUMARI	38	F	III	RIGHT/F4	42.6	INTACT	EXCELLENT	10	INTACT
25	KOWSALYA	48	F	II	LEFT/F4	11.7	INTACT	EXCELLENT	2.5	INTACT

MADURAI MEDICAL COLLEGE
MADURAI, TAMILNADU, INDIA -625 020
(Affiliated to The Tamilnadu Dr.MGR Medical University,
Chennai, Tamil Nadu)

ETHICS COMMITTEE CERTIFICATE

Name of the Candidate	:	Dr.Murugesan A
Course	:	PG in MS., Orthopedic
Period of Study	:	2016-2019
College	:	MADURAI MEDICAL COLLEGE
Research Topic	:	A prospective study on analysis of functional outcome of percutaneous release in trigger finger under ultrasound guidance – A Novel Technique
Ethical Committee as on	:	21.11.2017

The Ethics Committee, Madurai Medical College has decided to inform that your Research proposal is accepted.

Member Secretary

Chairman
Prof Dr V Nagaraajan
M.D., MNAMS, D.M., Dsc.,(Neuro), Dsc (Hon)
CHAIRMAN
IEC - Madurai Medical College
Madurai

Dean / Convenor
DEAN
Madurai Medical College
Madurai-20

27 NOV 2017

URKUND

Urkund Analysis Result

Analysed Document: TRIGGER FINGER THESIS book.docx (D42496282)
Submitted: 10/12/2018 9:12:00 PM
Submitted By: dr.murugesh87@gmail.com
Significance: 3 %

Sources included in the report:

DIABETIC HAND.docx aasiya (1).docx (D29222496)
https://pdfs.semanticscholar.org/8dc0/6c558c0681327aa6f7e8195d4d1488445420.pdf
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Instances where selected sources appear:

9

ABBREVIATION:

PIP JOINT	–	Proximal interphalangeal joint
POD	–	Post Operative Day
DASH	–	DISABILITY ARM SHOULDER AND HAND
USG	–	ULTRASONOGRAPHY